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AN APPRAISAL OF PESTICIDE USAGE AND SURFACE WATER QUALITY EFFECTS IN THE UNITED STATES

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ENVIRONMENTAL PROTECTION AGENCY

AN APPRAISAL OF PESTICIDE USAGE AND SURFACE WATER QUALITY EFFECTS IN THE UNITED STATES

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INTRODUCTION

Of an estimated 80,000 species of insects in North America, 10,000 are noxious species of more than casual consequence. Their annual depradation in terms of human health, crop loss and other economic damage has been estimated, for the United States alone, to exceed two billion dollars (Negherbon, 1969).

To combat these pests a variety of economic poisons have been developed, made economically feasible and designed and perfected for more specific action. Since the widespread usage of pesticides began in the 1940's, along with improved agricultural methodology, agricultural commodity production has reached proportions undreamed of 50 years ago.

However, the freshwater ecosystem, that community, including all the component organisms, together with the environment, which forms an interacting system, has received considerable abuse from the use of pesticides. Pesticide caused fish kills are common occurrences (Thoman and Nicholson, 1963; Reymonds, 1972), sediment residues are high (Holden, 1965), and surface water contamination exceeded toxic levels (Hinden, et al. 1972; Sparr, et al. 1965).

In recent years, largely at the prodding of various environmentalist groups and governmental agencies, changes have taken place to reduce the pesticide contamination of the freshwater ecosystem including

(1) use of shorter-lived, more readily degradable organo-phosphate, carbamate and herbicide compounds, and (2) significant changes in pesticide usage patterns that lessen the likelihood of a pesticide reaching a watercourse.

In the following sections an attempt will be made to evaluate the status of pesticides in the United States in relation to the freshwater ecosystem.

PESTICIDE USAGE

Data showing the quantities of pesticides used in the United States are limited. Figures on production, sales, imports, and exports shown in following tables give some indication of usage, but they do not account for changes in inventories.

The calculated domestic disappearance[1/] at the producers' level for a number of years is given for several pesticides (Table 1). DDT disappearance continued its general decline of recent years; down more than 28 percent from 1970 and amounting to less than one-fourth the disappearance in the peak year of 1959. Calcium arsenate and lead arsenate, together, were down almost one-fourth from the previous year. Among those chemicals for which disappearance data are available, the sharpest decline in 1971 was made by 2,4,5-T. Disappearance for it was down more than 70 percent following a sharp rise the previous year. Disappearance of 2,4-D declined nearly one-third. However, the aldrin-toxaphene group increased sharply, more than 36 percent.

The Census of Agriculture of 1969 includes some information on controlling insects, nematodes, fungi, and weeds. According to the census, about 143.1 million acres were treated for pest control in 1969. Nearly 63 percent of this acreage was treated for weed control and more than 29 percent was treated for insect control. Data are

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[1/] Disappearance, as defined here, refers to a lack of commercial production.

not available to show the ratio of usage for the several types of compounds available, however.

Applicators in Illinois treated more acreage for weed control than any other state, followed by Iowa and Texas. California, Pennsylvania and Ohio led in the treatment of hay for insect control. Illinois, Texas and Iowa were the leaders in treatment of crops, other than hay, for this purpose. Texas and Iowa spent the most money to treat livestock for insect control. California and North Carolina treated the largest acreage to control nematodes. Florida, California and Texas led in acreage treated for fungus control; Texas and Kansas for weed control in hay; and Illinois, Iowa, North Dakota and Minnesota for weed control in crops, other than hay. Texas, Mississippi, California and Arkansas led in acreage of crops defoliated. Illinois treated a total of more than 14 million acres, Texas over 13 million, and Iowa nearly 12 million acres for pest control. The average cost for controlling nematodes was $13.68 per acre; for fungus control, $13.41; for insect control in crops, other than hay, $7.45; for weed control in crops other than pasture, $4.07; for defoliation, $4.00; for insect control in hay, $3.96; and for weed control in pasture, $1.95.

PESTICIDE

PRODUCTION, SALES AND TRADE

Production and Sales. Production and sales of synthetic organic pesticides increased in 1971 following declines in 1969 and 1970. Before the two declining years, there were gains each year from 1957 through 1968.

Production in 1971 was $1,135.7 million, up 9.8 percent from 1970, recovering much of the losses sustained during the previous two years. However, production was still down 4.8 percent from the record year of 1968. The value of production was $1,282.6 million, up more than 21 percent from 1970 and the highest on record. The volume of producer sales was $946.3 million, up 7.4 percent to only 1.4 percent less than the record year of 1968. The value of these sales, also a new record, was $979.1 million, up more than 12 percent from the previous year.

Production and sales figures are detailed in Tables 2, 3, 4 and 5. Quantities in Table 2, which represent only organic pesticides, include some unavoidable duplication. However, this duplication is shown in parentheses in Table 3, and some figures for inorganic pesticides are included.

The Annual Survey of Manufacturers indicates that the value of manufacturer shipments of all pesticides and related chemicals in 1970 (latest year for which these data are available), was $1,383.6 million, down about 0.5 percent from 1969, which in turn was down about 1 percent

from the record year of 1968. Shipments of technical materials, however, were $334.8 million, up nearly 12 percent from the previous year and the highest on record. Those for pesticide preparations intended for agricultural purposes decreased 3.8 percent to $914.9 million.

PESTICIDES IN SURFACE WATERS

Pesticides are known to reach surface waters by a variety of routes. They may be applied to water to control pests such as mosquitos (Weidhass et al., 1960), blackflies (Arnason, 1971) or midges (Edwards et al., 1966); they may fall on water accidentally when applied as aerial treatments to control forest pests (Ide, 1975; Gorham, 1961), or agricultural pests (Moye and Luckmann, 1964); they may reach water by subsurface runoff from soil (Young and Nicholson, 1961) or from irrigation return flows (FWPCA, 1968), they may be discharged with sewage effluents (Holden and Marsden, 1966) or industrial effluents (Nicholson, 1967) or they may be carried from the atmosphere by rainfall (Tarrant and Taffon, 1968).

It remains difficult to assess the relative importance of sources of insecticide residues found in surface waters, but Nicholson (1967) states that the two principal sources of contamination are runoff from agricultural land and discharge of industrial wastes, either from manufacturers or formulating industries, or from those that use these compounds in their manufacturing processes (e.g., moth-proofing chemicals).

It is generally agreed that surface water contamination by pesticides in the United States is principally caused by agricultural activities (Li and Fleck, 1972). In addition to aerial spraying and subsurface runoff, careless application practices and disposal or washing of used pesticide containers have added substantial amounts of pesticides to surface waters (Li and Fleck, 1972; FWPCA, 1968).

Concern over surface water contamination by pesticides led to the development of monitoring programs in the early 1960's under Federal leadership. Table 6 summarizes the results of these monitoring programs for twenty western U. S. streams.

Pesticide distribution within the freshwater ecosystem depends on the compounds formulation and the chemistry or physics of the environment. Many pesticides are water-soluble (e.g., inorganic salts such as copper sulphate and organic salts like the herbicide Diquat) and readily become uniformly distributed throughout a lake or river.

Organo-chlorine insecticides or other less soluble pesticides, are formulated with emulsions or surfactants, in oil based solutions, or in organic solvents such as acetone. When pesticides enter the water in these forms usually quick dispersion takes place. Other formulations, such as wettable powders, granular pellets and baits are dispersed less rapidly. Most settle even in running water, and impregnate bottom sediments. Some dusts will remain on the water surface but will eventually become dispersed throughout the water column.

Once pesticides reach a watercourse, they do not remain in the same form for long. They may be transformed into other chemicals--biologically by sediment and water microorganisms, nonbiologically by photolysis, or by chemical means. The persistence, toxicity and other physiochemical properties are often affected by these transformations.

Several reviews discussing the metabolic and degradation products of pesticides in soils, water, plants and animals have been published in recent years with Li and Fleck (1972) being perhaps the most complete.

Another tendency of pesticides in water is to be accumulated by living organisms. Microscopic plants, higher aquatic vegetation and aquatic animals tend to accumulate pesticides from water and store them in or on bodily tissues. By this mechanism tremendous concentrations in the body tissues are possible. Cope (1966) reports that a 30-day exposure to 0.05 mg/l of Heptachlor with the bluegill sunfish resulted in a tissue concentration of 15.7 mg/l. Johnson et al. (1971) reports that the water flea, Daphnia magna concentrated the insecticide Aldrin to more than 141,000 times the water concentration within 72 hours. The importance of this process (termed biomagnification) lies in the fact that a pyramiding effect can occur through the food chain. Lower forms can accumulate considerable amounts and these levels are passed on to the next higher level in the food chain. Generally, the ultimate level in the aquatic ecosystem are fish.

Based on available information the general trend in the United States is towards relatively static concentrations of pesticides in surface waters. Table 6 does not adequately show this trend in that most pesticide monitoring programs have looked at only a few of the compounds used; it was not until ca. 1970 that selected organophosphate compounds were added to the list, for example.

PESTICIDE EFFECTS ON THE BIOTA

Hunt and Keith (1968) in addressing themselves to the effects of pesticides on the aquatic biota noted: (1) A direct effect resulting from the toxic action of pesticides during chronic or acute exposure, and (2) Indirect effects as a result of environmental changes (e.g., loss of food supply for primary consumers).

Unfortunately, available information on the indirect effects of pesticides is scanty. Such data as the elimination of a major food group on a given type of fish is not available.

Most assessments of ecological impact are based on direct toxic action of pesticides to fish. Johnson (1968) and Ware and Roan (1971) have presented excellent accounts on the effects of pesticides to fish and plankton and microorganisms, respectively. Li and Fleck (1972) provide a review of pesticide toxicity to all freshwater aquatic animals.

A more complex problem than that of toxicity is the accumulation of pesticides in various aquatic organisms. When pesticides reach water, they are rapidly absorbed by the bottom sediments, plankton, algae, aquatic invertebrates, aquatic vegetation and fish. Some of these take up the pesticide directly from water flowing through their bodies, or they may accumulate it through the food chain.

There is extensive literature on residues of organo-chlorine insecticides in fish, so only representative examples of the levels of residues of different pesticides found in fish are given in Table 7. The amounts of residues rarely exceed a few milligrams per liter; if much higher than this, it is usually from fish taken from very heavily contaminated areas (e.g., Lower Colorado River, FWPCA, 1968). The most common residues are DDT and its metabolites, dieldrin, aldrin, endrin and heptachlor. The most common insecticide is DDT, which generally is also present in the largest amounts.

Residues are not equally distributed in all the tissues of a fish, but concentrated in certain areas: adipose tissue, brain, liver, kidney or the gonads. Generally, it is thought that tissue residues in fish are accumulated through the gills; Edwards (1970) presents a review of pesticide pathways in fish and discusses this aspect in more detail.

Reported pesticide residues in fish are remarkably consistent (Table 7) and it is generally possible to associate occasional larger amounts with nearby pesticide applications.

Available data, such as in Table 7, illustrates the problem of a lack of sufficient data to draw definite conclusions on trends of pesticide usage within the United States. Such information as organo-phosphate residue levels (not included in monitoring programs until ca. 1970) is lacking or the fact that of 60,000 pesticide formulations only a handful are routinely analyzed for and these compounds are not always the most harmful compounds present.

Based on available information it appears that in recent years pesticide residue levels in fish are relatively static. No substantial changes are occurring. However, most reported data deals with organo-chlorine compounds, which, as stated earlier, are being phased out in favor of newer compounds. With increased use of these newer compounds, which show little propensity to accumulate in tissues (Johnson, 1974), a decline may be evidenced in the next few years as the ecosystem purges itself of the organo-chlorine compounds.

While current pesticide levels in surface waters and fish remain relatively constant, the next few years may see a decline in pesticide contamination of fish and surface waters due to several factors: (1) a greater shift to shorter-lived organo-phosphate, carbamate and herbicide compounds, (2) changes in agricultural practices that lessen the chances for pesticides entering a watercourse, (3) development and implementation of non-chemical means of insect control, (4) more attention paid to the timing of pesticide applications to catch an insect pest at a vulnerable time in the life cycle and thus using less material, (5) legal regulations, and (6) an awareness of the problems by pesticide applicators, distributors and manufacturers who are awaking to the fact that environmental contamination is a very real problem.

REGULATIONS AND LAWS

With the establishment of the Environmental Protection Agency in 1970 many functions scattered throughout Federal agencies relating to pesticides were gathered together and, through several reorganizations, now are centered in the Office of Pesticides, reporting to the Assistant Administrator for Water and Hazardous Materials. Principal functions include: (1) responsibility for pesticide label registration, (2) pesticides research and standards setting, (3) certain pesticide research functions carried out by the Bureau of Sport Fisheries and Wildlife of the Department of the Interior.

Not all functions with respect to pesticides in Federal Government were transferred to EPA. The responsibility of enforcement of EPA's tolerance levels in food will remain in the Food and Drug Administration (FDA). FDA will also maintain surveillance programs to determine pesticide levels in food, continue research to improve analytical methods of determining pesticide levels in food and studies on the long-term effects of pesticides on human health.

The legal basis for Federal involvement in pesticide management is the Federal Environmental Pesticide Control Act of 1972. A brief summary of the Act is as follows:

A. This Act requires the registration of any pesticide or device which is sold, distributed or delivered, and the registration of any establishment that produces pesticides with the Administrator of the EPA. The registration is generally concerned with labeling, warnings, contents and use.

B. As part of the registration, the Administrator classifies the pesticide as for general use, restricted use, or both. General use signifies that the pesticide, when applied in normal circumstances and in accordance with the directions, warnings and cautions, will not cause unreasonable adverse effects on the environment. Restricted use signifies that the pesticide presents a hazard to the applicator or may cause unreasonable adverse effects on the environment. A restricted use pesticide can only be applied under the supervision of a certified applicator and subject to restrictions as the Administrator may provide by regulation.

C. The Administrator may also issue Experimental Use Permits in order for an applicant to accumulate the information necessary to register a pesticide or to conduct any studies that may be desired.

D. Any State may adopt a program to certify applicators, issue experimental use permits, and to locally register pesticides, if the program is approved by the Administrator.

E. The Administrator, in addition to enforcing registration, certification, and permits, has the following powers:

1. To issue an order to stop the sale, use, or removal of any pesticide or device, that there is reason to believe on the basis of inspection or tests, is in violation of this Act.

2. To initiate seizure and condemnation proceedings against a pesticide. This is mainly for pesticides in transit or in unsold and unbroken packages that have violated a labeling provision.

3. To cancel or change the classification of a registered pesticide. This action becomes final after 30 days from the date of notification to registrant unless the necessary corrections are made or a hearing is requested.

4. To suspend the registration of a pesticide when necessary to prevent an imminent hazard during the time required for cancellation or change in classification proceedings. The registrant must be notified before the suspension order is issued and must have the opportunity for an expedited hearing on the question of whether an imminent hazard exists.

5. To issue an emergency order in advance of notification to the registrant, when an emergency exists that does not permit the Administrator to hold a hearing before suspension.

In addition to the Act, EPA has proposed two additional sets of standards, the Toxic Pollutant Effluent Standards ("Toxic Substance List") and "Proposed EPA Numerical Criteria for Water Quality".

The Toxic Substance List contains regulations establishing effluent standards for several toxic pollutants: aldrin, dieldrin, benzidine and its salts, cadmium and all cadmium compounds, cyanide and all cyanide compounds, DDT, DDD, DDE, endrin, mercury and all mercury compounds, polychlorinated biphenyls (PCB's) and toxaphene.

Refering to the purposes of these effluent standards, the regulations, in part, read: "To avoid the effects of chronic toxicity, an effluent standard is provided which is designed to ensure that, in most cases, the proposed Water Quality Criteria, which are intended to provide protection from chronic effects, are not exceeded over the long term in the receiving waters. This is achieved by limitations of the total weight of the pollutant which can be discharged into receiving waters of given size." (EPA, 1973).

Water quality criteria published pursuant to the Act are those concentrations which are acceptable in the receiving water body. The criteria were developed to protect a variety of water uses, with the protection of fish and wildlife and potable water supplies being the most sensitive of the freshwater usages. These criteria were devised, from available data, to protect against both acute and chronic toxicological effects. Table 8 shows the numerical values proposed for a number of commonly used pesticides.

DISCUSSION

From the data presented in this report, several features are evident: (1) 1968 was the peak year for pesticide production in the United States, with 1971 data (latest available) showing about a five percent decline from 1968, (2) during the time period of 1966-71 significant reductions were made in several groups of pesticides, most notably with the aldrin-toxaphene group, DDT, 2,4-D and 2,4,5-T. (While data is not available to indicate it as such, this time period corresponds with the shift from organochlorine-type compounds to the newer organophosphate and carbamate compounds), (3) occurrences of pesticides in water are in a relatively static state, (4) pesticide residues in fish are remaining relatively constant and (5) Federal action has resulted in stringent water quality and effluent standards relating to pesticides.

Definitive conclusions are difficult to draw, but a safe assumption would be that pesticide contamination of the freshwater ecosystem will continue to be a problem. When considering information, such as contained in this report, on the current status of pesticides the feeling of optimism pervades, however. With the discontinuance of most usages of the persistent pesticides, in development of non-chemical means of insect control (such as biological control), in changes that are occurring in agricultural and industrial processes, in laws and regulations at all levels of government and in the attitudes of the public and private sectors towards environmental damage, it may be that in years to come the threat from pesticides will diminish.

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TABLE 1

PESTICIDES: DOMESTIC DISAPPEARANCE AT THE PRODUCERS' LEVEL OF SELECTED KINDS, UNITED STATES, 1966-71[1]

Pesticide	1966	1967	1968	1969	1970	1971
	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds
Aldrin-toxaphene group	86,646	86,289	33,710	89,721	62,282	85,005
Calcium arsenate	2,942	2,329	1,992	2,117	2,900	2,457
Copper sulfate	104,020	85,274	87,452	99,840	77,344	70,272
DDT	45,603	40,257	32,753	30,256	25,457	18,234
Lead arsenate	6,944	6,152	4,747	7,721	5,860	4,142
2,4-D	63,903	66,955	68,404	49,526	46,942	32,174
2,4,5-T	17,080	15,381	15,804	3,218	4,871	1,389

[1]Calculated from data supplied by the Tariff Commission, and Bureau of Mines.

*Refers to the lack of commercial production.

TABLE 2

SYNTHETIC ORGANIC PESTICIDES: PRODUCTION AND SALES, UNITED STATES, 1962-71[1]

Year	Quantity	Change from Previous Year	Value	Change from Previous Year
	1,000 pounds	Percent	1,000 dollars	Percent
	Production			
1962	729,718	4.3	427,373	18.1
1963	763,477	4.6	444,046	3.9
1964	782,749	2.5	473,815	6.7
1965	877,197	12.1	576,787	21.7
1966	1,013,110	15.5	715,362	24.0
1967	1,049,663	3.6	959,260	34.1
1968	1,192,360	13.6	1,028,469	7.2
1969	1,104,381	-7.4	953,592	-7.3
1970	1,034,075	-6.4	1,058,389	11.0
1971	1,135,717	9.8	1,282,630	21.2
	Sales (domestic and export)			
1962	633,962	3.6	346,301	14.3
1963	651,471	2.8	369,140	6.6
1964	692,355	6.3	427,111	15.7
1965	763,905	10.3	497,066	16.4
1966	822,256	7.6	583,802	17.4
1967	897,363	9.1	787,043	34.8
1968	959,631	6.9	849,240	7.9
1969	928,663	-3.2	851,166	0.2
1970	880,914	-5.1	870,314	2.2
1971	946,337	7.4	979,083	12.5

[1]Tariff Commission, Chemical Division, "Synthetic Organic Chemicals, United States Production and Sales."

TABLE 3

PESTICIDAL CHEMICALS: PRODUCTION BY CLASSES, UNITED STATES, 1967-71

Pesticide	1967	1968	1969	1970	1971
	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds	1,000 pounds
Fungicides					
Copper Naphthenate	3,473	1,718	1,345	1,730	1,693
Copper sulfate	33,992	37,192	42,072	28,768	31,112
Dithiocarbamic acid salts				39,381	35,110
Ferbam	2,331	1,900	1,300		
Maneb	1,361	2,000	1,938		
Zineb	3,055	3,081	2,500		
Mercury fungicides	912	1,448	941	1,114	601
Pentachlorophenol (PCP)	44,239	48,573	45,988	47,170	50,877
2,4,5-Trichlorophenol and salts	25,254	28,066			
Other organic fungicides	63,269	66,793	85,607	50,307	60,875
Total	177,886	190,773	182,091	168,470	180,270
Herbicides					
2,4-D acid	(77,139)	(79,263)	(47,077)	(43,576)	
2,4-D acid, esters, and salts	83,750	94,116	56,998		
DNBP, ammonium salts	58				
Maleic hydrazide			2,771	3,271	
Methanearsonic acid salts				30,434	24,476
Phenyl mercuric acetate (PMA)	518	582	534	457	337
Silvex			1,597	2,016	
Sodium chlorate	30,000	30,000	30,000	30,000	30,000
2,4,5-T acid	(14,552)	(17,530)	(8,888)		
2,4,5-T acid, esters, and salts	27,189	42,542	11,626	12,335	
Other organic herbicides	206,759	235,541	268,238	312,132	404,036
Total	439,965	499,514	423,840	434,241	458,849
Insecticides, fumigants, rodenticides					
Aldrin-toxaphene group	120,183	115,974	107,311	88,641	116,264
Calcium arsenate	2,040	3,398	1,158	1,144	940
DDT	103,411	139,401	123,103	59,316	
Dibromochloropropane	5,240	7,887	8,611		
Lead arsenate	3,952	9,016	9,204	4,156	6,168
Methyl bromide	19,665	20,454	20,033	21,047	
Organophosphorus insecticides				132,496	(138,185)
Methyl parathion	33,344	38,153	50,572	41,353	37,226
Parathion	11,361	20,000		15,259	
Other				73,884	100,959
Other organic insecticides	202,600	227,326	260,892	188,632	303,261
Total	503,796	581,619	580,884	495,432	564,818
Grand total	1,029,956	1,175,173	1,134,739	1,094,567	1,203,937

TABLE 4

SYNTHETIC ORGANIC PESTICIDES: UNITED STATES IMPORTS
BY SELECTED KINDS, 1966-71

Pesticide	1966	1967	1968	1969	1970	1971
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
Fungicides						
Carboxin	0	0	0	0	1,750	288
Chloranil	13,120	130,870	103,410	110,109	106,975	327,576
Chlorothalonil	0	0	0	0	896,000	2,188,483
Copper 8-quinolinolate	24,805	47,600	7,071	1,000	3,205	17,640
Dazon	24,751	14,062	31,923	11,243	0	0
DCNA	0	0	0	2,100	96,692	3,305
Dichlone	138,793	36,574	172,758	148,079	175,022	225,026
Oxycarboxin	0	0	0	10,250	1,750	0
Pentachloronitrobenzene	40,000	30,000	20,000	132,400	0	0
Thiram	14,330	110,538	107,001	0	0	0
2,4,5-Trichlorophenol	0	71,060	79,261	0	0	0
Herbicides						
Bromoxynil	91,215	58,000	40,240	63,280	117,115	252,397
Chlorflurenol	0	0	0	0	30,093	0
Chloroxuron	206,406	165,380	145,502	0	0	0
Dichlobenil	0	0	0	34,888	74,537	80,523
2,4-D	0	2,805,354	2,473,578	0	79,600	1,984
Dinitrocresol	0	42,952	55,040	6,400	0	3,432
Dichlorprop	0	604,160	535,563	525	0	0
Diquat dibromide	501,770	107,670	374,100	744,318	245,280	860,160
Diuron	0	0	0	0	0	234,310
Ioxynil	0	0	3,300	0	0	0
Maleic hydrazide	0	0	0	3,307	88,000	99,146
MCPA	0	141,736	0	104,107	76,750	313,614
MCPB	31,007	40,318	39,352	0	116,000	147,840
Mecoprop	304,627	120,406	156,055	312,627	741,313	1,024,096
Monuron	0	0	0	0	0	35,000
Neburon	0	40,000	64,092	60,036	20,000	0
Nitrofen	0	0	22,046	0	0	0
Paraquat	927,390	1,033,475	1,663,685	2,945,619	2,729,665	5,104,362
Phenmedipham	0	0	0	48,305	167,350	351,811
Metobromuron	44,092	110	24,967	49,714	99,206	0
Preforan	0	0	0	82,407	147,156	0
Propham	0	0	0	0	0	5,300
Pyrazon	89,600	111,039	144,472	103,040	122,080	0
2,4,5-T	0	25,904	315,556	45,418	0	90,720
Insecticides and miticides						
Aldrin	0	212,082	0	0	0	0
Bromophos	0	0	0	199,956	0	0
DDT	0	0	0	0	0	60,186
Dicofol	0	0	0	4,564	0	0
Dieldrin	0	0	0	12,885	0	0
Fenitrothion	1,573	4,409	0	11,022	3,308	0
Fundal	0	0	0	0	30,885	0
Leptophos	0	0	0	0	0	22,046
Lindane	65,806	0	0	0	0	0
Malathion	415	0	551	466,291	135,889	730,815
Methyl parathion	363,739	126,765	0	0	0	6,613,753
Ovex	0	0	0	2,205	14,440	0
Oxythioquinox	102,605	0	0	40,265	34,832	0
Parathion	22,046	20,944	0	0	0	0
Phosalone	0	0	0	0	398,647	1,174,308
Piperonyl butoxide	9,260	11,464	0	0	0	0

TABLE 4 (Continued)

SYNTHETIC ORGANIC PESTICIDES: UNITED STATES IMPORTS BY SELECTED KINDS, 1966-71

Pesticide	1966 (Pounds)	1967 (Pounds)	1968 (Pounds)	1969 (Pounds)	1970 (Pounds)	1971 (Pounds)
Propoxur	0	33,069	172,777	83,100	0	19,938
Tetramethrin	0	0	0	0	0	6,118
Zinophos	0	31,416	0	0	0	0
Rodenticides						
ANTU	5,000	2,000	3,637	5,676	3,858	6,123
Pindone	0	0	210	0	0	0
Warfarin	540	11,308	1,241	10,240	420	5,475
Other						
p-Chloro-m-cresol	59,802	42,519	72,508	31,720	56,016	37,236
Hexachlorophene	0	88,184	0	150,321	0	0
Methyl bromide	316,354	0	0	0	0	0

[1]Tarriff Commission, Chemical Division, "Imports of Benzenoid Chemicals and Products." 1972.

TABLE 3

PESTICIDES: UNITED STATES EXPORTS
BY CLASSES, 1970-71

Export Grouping	Volume		Value	
	1970 Pounds	1971 Pounds	1970 Dollars	1971 Dollars
	Fungicides			
Inorganic fungicides, tech.	4,969,442	3,629,085	1,542,850	2,078,066
Organic fungicides, tech.	3,008,896	6,671,609	4,336,094	5,284,260
Fungicide formulations	(31,327,872)	(30,704,451)	(17,858,647)	(25,161,955)
Captan and mercury formulations	1,364,185	1,320,061	1,138,691	759,495
Dithiocarbamic acid formulations	12,083,105	8,913,844	4,441,866	3,853,825
Other	17,760,582	20,468,546	12,258,130	20,548,635
Total	41,305,910	43,005,143	23,737,591	32,524,281
	Herbicides			
Inorganic herbicides, tech.	1,787,250	1,375,908	494,776	448,484
Organic herbicides, tech.	(44,156,509)	(44,685,117)	(32,920,128)	(28,843,961)
2,4-D and 2,4,5-T, (acid basis)	9,370,382	10,810,871	3,304,363	3,801,514
Sodium salt of dichloropropionic acid	2,190,224	2,213,607	902,490	1,047,844
Pentachlorophenate and mercury-containing	343,462	388,925	461,221	441,614
Other	31,752,271	31,071,714	28,251,834	23,553,989
Herbicide formulations	33,016,862	38,448,263	28,724,849	36,626,821
Total	77,960,621	84,309,288	62,139,753	65,919,266
	Insecticides			
Inorganic insecticides, tech.	3,602,285	2,493,192	1,077,938	944,233
DDT, (100% basis)	(69,550,018)	(45,133,576)	(14,366,002)	(10,042,060)
Technical grade	15,298,811	17,395,016	2,433,077	3,186,784
Formulations containing 20%-74% DDT	2,492,913	3,134,817	520,572	571,582
Formulations containing 75% or more DDT	51,758,294	24,583,743	11,412,353	6,283,694
Aldrin-toxaphene group, tech.	22,606,240	30,438,822	12,632,671	16,379,378
Other polychlor insecticides, tech.	17,613,442	9,770,272	4,129,022	2,788,767
Other polychlor insecticide formulations	7,360,829	7,938,282	3,838,452	3,931,350
Parathion and methyl parathion, tech.	10,667,736	19,017,300	4,919,774	7,950,999
Other organic phosphorus insecticides, tech.	28,470,250	31,270,781	22,308,021	23,128,503
Organic phosphorus insecticide formulations	13,319,639	20,845,309	11,748,383	17,230,541
Other organic insecticides, tech.	27,256,762	40,366,443	20,660,167	34,691,638
Other organic insecticide formulations	23,203,012	18,715,099	13,944,613	11,844,388
Household & industrial formulations	12,627,422	11,434,164	9,215,537	7,737,020
Total	236,477,655	237,503,440	119,040,600	136,664,897
	Other			
Organic rodenticides, tech.	180,579	319,647	126,575	106,637
Disinfectants, tech.	3,023,195	3,032,731	4,825,134	4,294,077
Disinfectant formulations	3,139,489	3,538,626	2,345,236	2,505,283
Dips, growth regulators	4,197,173	3,593,739	2,383,635	2,192,316
Organic fumigants, tech.	33,893,578	43,119,689	5,814,185	6,394,860
Total	44,414,014	53,603,432	15,394,762	16,493,193
Grand total	404,158,200	422,521,305	220,312,706	251,601,637

TABLE 6

PESTICIDE CONTENT OF SELECTED STREAMS IN WESTERN UNITED STATES

Date	Residues in µg/Liter
MISSOURI RIVER AT NEBRASKA CITY, NEBRASKA	
01/20/69	.13 (2,4-D)
04/11/69	.01 (DDT); .02 (Dieldrin)
05/14/69	.01 (DDT)
06/20/69	.20 (2,4-D)
07/31/69	.01 (Dieldrin)
09/30/69	.01 (DDD); .01 (DDT); .01 (Dieldrin)
12/30/69	.05 (2,4-D)
01/26/70	.01 (DDT; .01 (Lindane); .05 (2,4-D)
02/24/70	.03 (2,4-D); .01 (2,4,5-T)
04/08/70	.06 (2,4-D)
05/22/70	.01 (Dieldrin)
06/09/70	.06 (2,4-D); .01 (2,4,5-T)
07/24/70	.03 (2,4-D)
09/17/70	.01 (DDD); .01 (DDT)
01/22/71	.01 (Lindane); .04 (2,4-D)
03/16/71	.01 (DDT); .01 (Dieldrin)
06/29/71	.05 (Diazinon)
07/16/71	.01 (Dieldrin); .10 (2,4,5-T)
08/05/71	.07 (2,4-D); .01 (Silvex)
YELLOWSTONE RIVER NEAR BILLINGS, MONTANA	
01/10/69	.05 (2,4-D); .01 (2,4,5-T)
03/10/70	.42 (2,4-D)
08/10/71	.04 (2,4-D)
JAMES RIVER AT HURON, SOUTH DAKOTA	
10/31/68	.16 (2,4-D)
11/27/68	.16 (2,4-D)
12/27/68	.43 (2,4-D); .17 (2,4,5-T)
03/18/69	.01 (Lindane)
04/25/69	.15 (2,4-D)
05/22/69	.14 (2,4-D)
06/16/69	.01(Lindane); .13 (2,4-D); .01 (2,4,5-T)
07/28/69	.11 (2,4-D)
09/15/69	.04 (2,4-D)
10/14/69	.26 (2,4-D)
11/12/69	.03 (2,4-D)
12/02/69	.07 (2,4-D)
01/09/70	.05 (2,4-D)
03/12/70	.19 (2,4-D)
04/09/70	.06 (2,4-D)
05/26/70	.05 (2,4-D)
06/24/70	.39 (2,4-D)
07/16/70	.38 (2,4-D)
08/12/70	.14 (2,4-D)
09/17/70	.11 (2,4-D)
10/13/70	.04 (2,4-D)
11/17/70	.40 (2,4,5-T)
03/16/71	.01 (Lindane)
PLATTE RIVER AT BRADY, NEBRASKA	
12/02/68	.21 (2,4-D)
03/04/69	.09 (2,4-D); .02 (2,4,5-T)
07/10/69	.03 (Silvex)
01/26/70	.06 (2,4-D)
11/17/70	.01 (DDT)
ARKANSAS RIVER BELOW JOHN MARTIN RESERVOIR, COLORADO	
10/24/68	.03 (Silvex)
01/08/69	.02 (DDD); .02 (2,4,5-T)
06/03/69	.14 (2,4-D)
07/07/69	.01 (Lindane)
08/19/69	.02 (DDT); .02 (Dieldrin)
09/09/69	.01 (DDD); .02 (DDE); .05 (DDT); .01 (Dieldrin); .04 (Lindane)
10/06/69	.01 (Dieldrin)
04/07/70	.02 (Lindane)
05/14/70	.01 (DDT); .01 (2,4-D); .02 (2,4,5-T)

Date	Residues in µg/Liter
ARKANSAS RIVER BELOW JOHN MARTIN RESERVOIR, COLORADO (Continued)	
07/07/70	.01 (DDD); .01 (DDT); .01 (Dieldrin)
10/06/70	.01 (Dieldrin)
04/02/71	.01 (2,4,5-T)
08/10/71	.01 (DDE)
09/09/71	.04 (2,4-D)
ARKANSAS RIVER AT VAN BUREN, ARKANSAS	
10/15/68	.01 (DDT)
12/18/68	.03 (2,4,5-T)
01/07/69	.08 (DDD); .08 (2,4-D); .05(2,4,5-T)
02/10/69	.11 (2,4-D); .06 (2,4,5-T)
05/08/69	.02 (2,4,5-T)
06/10/69	.07 (2,4-D); .07 (2,4,5-T)
07/16/69	.04 (2,4,5-T)
08/14/69	.03 (2,4,5-T)
09/17/69	.02 (2,4,5-T)
10/14/69	.01 (DDD); .02 (DDT); .01 (Lindane); .05 (2,4,5-T)
11/20/69	.02 (2,4,5-T)
01/23/70	.01 (DDD); .09 (DDT)
02/17/70	.05 (DDT); .01 (2,4,5-T)
04/17/70	.01 (DDT); .01 (Dieldrin); .03 (2,4-D); .02 (2,4,5-T)
06/17/70	.06 (2,4-D); .06 (2,4,5-T)
07/17/70	.01 (DDE); .05 (DDT); .02 (2,4,5-T)
08/17/70	.06 (DDT); .02 (2,4,5-T); .07 (Diazinon)
09/18/70	.02 (2,4,5-T)
10/13/70	.05 (DDT); .06 (2,4,5-T)
11/18/70	.01 (DDT)
01/13/71	.03 (2,4,5-T)
04/14/71	.01 (2,4,5-T); .02 (Diazinon)
05/12/71	.01 (2,4,5-T)
06/16/71	.01 (2,4,5-T)
07/23/71	.01 (2,4,5-T)
08/18/71	.02 (2,4,5-T)
10/01/71	.03 (2,4,5-T)
CANADIAN RIVER NEAR WHITEFIELD, OKLAHOMA	
10/22/68	.04 (Silvex); .05 (2,4,5-T)
11/19/68	.15 (2,4-D); .05 (2,4,5-T)
12/19/68	.03 (2,4,5-T)
01/22/69	.02 (DDD); .15 (2,4-D); .09 (2,4,5-T)
02/27/69	.04 (2,4,5-T)
03/25/69	.04 (2,4,5-T)
04/30/69	.05 (2,4,5-T)
05/15/69	.04 (2,4,5-T)
06/19/69	.04 (2,4,5-T)
07/25/69	.03 (2,4,5-T)
08/27/69	.01 (DDT); .03 (2,4,5-T)
10/30/69	.02 (2,4,5-T)
11/26/69	.03 (2,4,5-T)
02/26/70	.04 (2,4,5-T)
03/24/70	.01 (DDT); .02 (2,4,5-T)
04/21/70	.03 (2,4,5-T)
05/27/70	.02 (2,4,5-T)
06/25/70	.03 (2,4,5-T)
07/29/70	.03 (2,4,5-T)
08/27/70	.03 (2,4,5-T)
09/29/70	.01 (2,4,5-T)
12/22/70	.02 (2,4,5-T)
01/20/71	.03 (2,4,5-T)
02/02/71	.01 (Lindane); .02 (2,4,5-T)
03/17/71	.01 (Lindane)
04/20/71	.01 (2,4,5-T); .01 Diazinon)
05/12/71	.01 (2,4,5-T)
09/08/71	.09 (DDT); .02 (2,4,5-T)

TABLE 6

PESTICIDE CONTENT OF SELECTED STREAMS IN WESTERN UNITED STATES

(CONTINUED)

Date	Residues in ug/Liter
BRAZOS RIVER AT RICHMOND, TEXAS	
10/07/68	.01 (DDD); .01 (DDE); .01 (DDT); .02 (2,4,5-T)
11/26/68	.01 (DDE); .01 (DDT)
12/23/68	.01 (DDE); .01 (DDT)
03/13/69	.01 (DDD); .02 (DDE); .04 (DDT); .02 (2,4,5-T)
04/18/69	.01 (DDD); .05 (DDE); .04 (DDT); .18 (2,4-D); .04 (2,4,5-T)
06/06/69	.05 (2,4-D); .02 (2,4,5-T)
06/13/69	.06 (2,4-D); .02 (2,4,5-T)
10/27/69	.01 (2,4,5-T)
02/19/70	.01 (2,4,5-T)
03/19/70	.03 (DDD); .04 (DDE); .08 (DDT); .04 (2,4-D); .02 (2,4,5-T)
04/29/70	.01 (DDD); .01 (DDE); .01 (DDT); .01 (2,4,5-T)
05/18/70	.06 (2,4-D); .01 (2,4,5-T)
06/01/70	.03 (DDD); .04 (DDE); .06 (DDT); .01 (Lindane); .07 (2,4-D); .01 (2,4,5-T)
08/18/70	.2 (PCB's)
11/03/70	.01 (DDE); .02 (2,4,5-T); .3 (PCB's)
12/17/70	.02 (Dieldrin); .5 (PCB's)
02/17/71	.1 (PCB's)
04/07/71	.01 (2,4,5-T)
06/15/71	.06 (DDE); .39 (DDT)
06/16/71	.2 (PCB's)
08/18/71	.01 (DDE); .01 (DDT); .01 (Dieldrin); .4 (PCB's)
COLORADO RIVER AT WHARTON, TEXAS	
12/19/68	.02 (2,4,5-T)
01/21/69	.03 (DDD)
03/05/69	.01 (Aldrin); .01 (DDT); .01 (Dieldrin)
04/23/69	.01 (DDE); .02 (DDT); .01 (2,4,5-T)
06/04/69	.04 (DDT); .03 (2,4,5-T)
06/13/69	.01 (2,4,5-T)
08/21/69	.02 (DDT); .01 (Lindane)
10/29/69	.01 (DDD)
03/19/70	.01 (DDD); .01 (DDE); .03 (DDT); .05 (2,4-D)
04/29/70	.01 (DDT)
05/18/70	.02 (DDD); .02 (DDE); .03 (DDT); .40 (2,4-D); .06 (2,4,5-T)
10/27/70	.01 (2,4,5-T)
02/17/71	.04 (2,4,5-T)
RIO GRANDE BELOW ANZALDUAS DAM, TEXAS	
10/15/68	.01 (DDE)
11/20/68	.02 (Silvex)
05/15/69	.01 (DDE)
07/16/69	.02 (DDD); .01 (DDE); .01 (DDT); .01 (Lindane)
01/19/70	.02 (DDT)
05/11/70	.01 (DDE); .01 (2,4,5-T)
07/16/70	.01 (DDD); .01 (DDE); .01 (DDT); .23 (Methyl parathion); 1.0 (Parathion)
07/19/71	.01 (2,4,5-T)
10/15/71	.02 (DDE)
PECOS RIVER NEAR ARTESIA, NEW MEXICO	
11/01/68	.02 (DDD); .01 (DDE); .46 (DDT); .01 (Lindane)
12/02/68	.15 (2,4-D)
01/03/69	.10 (2,4-D); .05 (2,4,5-T)
03/03/69	.02 (Chlordane)
09/02/69	.02 (DDT)
11/04/69	.01 (Dieldrin); .02 (Lindane)

Date	Residues in ug/Liter
PECOS RIVER NEAR ARTESIA, NEW MEXICO (Continued)	
01/02/70	.01 (Lindane)
03/02/70	.01 (Lindane); .08 (Methyl parathion)
09/01/70	.01 (DDT)
03/01/71	.01 (Silvex)
04/01/71	.01 (Silvex); .04 (2,4,5-T)
08/02/71	.01 (DDT)
09/01/71	.04 (2,4-D)
COLORADO RIVER (YUMA MAIN CANAL) AT YUMA, ARIZONA	
01/07/69	.14 (2,4-D); .03 (2,4,5-T)
03/04/69	.24 (2,4-D); .04 (Silvex); .07 (2,4,5-T)
12/01/70	.01 (DDT)
GREEN RIVER AT GREEN RIVER, UTAH	
11/18/68	.01 (DDT)
03/09/70	.1 (PCB's)
05/13/70	.01 (DDT)
08/06/70	.15 (2,4,5-T)
GILA RIVER ABOVE DIVERSIONS AT GILLESPIE DAM, ARIZONA	
10/16/68	.03 (DDD); .08 (DDE); .02 (DDT); .03 (Dieldrin); .01 (Lindane)
11/19/68	.01 (DDD); .04 (DDE); .02 (DDT); .01 (Dieldrin); .01 (Lindane) .11 (Silvex)
12/16/68	.01 (DDD); .10 (DDE); .05 (DDT); .03 (Dieldrin); .07 (Lindane)
01/15/69	.02 (DDD); .04 (DDE); .01 (DDT); .01 (Dieldrin); .01(Lindane) .06 (Silvex)
02/17/69	.03 (DDE); .01 (DDT); .01 (Dieldrin); .01(Lindane)
03/14/69	.02 (DDE); .01 (Lindane)
04/17/69	.02 (DDE); .01 (Dieldrin); .02 (Lindane)
05/20/69	.01 (DDD); .02 (DDE)
06/18/69	.01 (DDD); .08 (DDE); .02 (Dieldrin); .01(Lindane)
08/20/69	.02 (DDD); .05 (DDE); .03(DDT)
09/17/69	.02 (DDE); .03 (DDT); .03 (Endrin); .01 (Lindane)
10/13/69	.01 (DDD); .01 (DDE); .01 (DDT); .01 (Dieldrin); .01 (Endrin); .02 (Lindane); .01 (2,4,5-T)
11/21/69	.01 (DDD); .03 (DDE); .01 (DDT); .02 (Lindane); .05 (2,4-D)
12/18/69	.04 (DDD); .02 (DDE); .02 (DDT); .02 (Lindane); .03 (2,4-D)
01/22/70	.02 (DDD); .04 (DDE); .02 (DDT); .01 (Lindane)
02/17/70	.02 (DDD); .04 (DDE); .01 (DDT); .01 (Endrin); .02 (Lindane); .02 (Endosulfan)
04/01/70	.02 (DDD); .05 (DDE); .01 (DDT); .01 (Lindane)
05/04/70	.02 (DDD); .03 (DDE); .01 (DDT)
06/03/70	.01 (DDD); .04 (DDE); .01 (DDT)
07/02/70	.01 (DDD); .02 (DDE); .01 (Dieldrin)
07/30/70	.01 (DDD); .04 (DDE)
09/01/70	.02 (DDE); .04 (Methyl parathion) .04 (Parathion)
10/01/70	.01 (DDE); .01 (Lindane); .02 (Methyl parathion); .04 (Parathion)

TABLE 6

PESTICIDE CONTENT OF SELECTED STREAMS IN WESTERN UNITED STATES

(CONTINUED)

Date	Residues in ug/Liter
GILA RIVER ABOVE DIVERSIONS AT GILLESPIE DAM, ARIZONA (Continued)	
11/02/70	.02 (DDE); .10 (Methyl parathion); .10 (Diazinon)
12/02/70	.01 (DDE); .06 (Lindane)
01/08/71	.05 (DDE); .02 (DDT); .01 (Dieldrin); .05 (Lindane)
02/01/71	.01 (DDE); .01 (Dieldrin); .01 (Lindane)
03/02/71	.01 (DDE); .01 (Dieldrin); .01 (Lindane)
04/06/71	.02 (DDD); .08 (DDE); .01 (Lindane)
05/07/71	.02 (DDE); .01 (Diazinon)
06/01/71	.02 (DDE); .04 (Diazinon)
07/01/71	.02 (DDE)
08/18/71	.01 (Silvex)
09/01/71	.03 (DDE); .05 (DDT)
HUMBOLDT RIVER NEAR RYE PATCH, NEVADA	
10/01/68	.14 (Silvex)
11701/68	.05 (Silvex)
12/02/68	.01 (Silvex)
12/31/68	.18 (2,4-D); .07 (2,4,5-T)
03/03/69	.02 (Silvex)
04/01/69	.02 (Silvex)
05/01/69	.01 (DDT); .07 (Silvex)
06/02/69	.10 (Silvex)
06/30/69	.11 (Silvex)
08/01/69	.08 (Silvex)
09/02/69	.07 (Silvex)
10/01/69	.06 (Silvex)
11/03/69	.05 (Silvex)
12/01/69	.03 (Silvex)
01/02/70	.05 (Silvex)
02/02/70	.05 (Silvex)
03/03/70	.05 (Silvex)
04/01/70	.01 (Lindane); .05 (Silvex)
05/01/70	.06 (Silvex)
06/01/70	.04 (Silvex)
07/01/70	.03 (Silvex)
08/31/70	.01 (Silvex)
10/01/70	.02 (Silvex)
11/03/70	.02 (Silvex)
12/01/70	.02 (Silvex)
12/31/70	.01 (Silvex)
02/01/71	.01 (Silvex)
03/01/71	.02 (Silvex)
04/01/71	.02 (Silvex)
05/03/71	.01 (Silvex)
SACRAMENTO RIVER AT VERONA, CALIFORNIA	
12/12/68	.22 (2,4-D); .08 (2,4,5-T)
08/19/69	.01 (DDT); .02 (2,4-D); .03 (2,4,5-T)
10/27/69	.04 (2,4-D); .01 (Silvex); .02 (2,4,5-T)
12/30/69	.01 (2,4,5-T)
03/03/70	.07 (2,4-D)
05/21/70	.02 (2,4-D); .01 (2,4,5-T); .10(Methyl parathion); .16 (Parathion)
07/01/70	.01 (Silvex)
08/11/70	.01 (Silvex)
09/10/71	.11 (Methyl parathion); .04 (Parathion)

Date	Residues in ug/Liter
FEATHER RIVER NEAR ORROVILLE, CALIFORNIA	
10/08/68	.02 (DDT)
12/-/68	.99 (2,4-D); .18 (2,4,5-T)
01/03/69	.06 (2,4-D); .07 (Silvex); .03 (2,4,5-T)
05/01/69	.06 (2,4,5-T)
06/05/69	.01 (2,4,5-T)
11/03/70	.02 (2,4,5-T)
03/26/71	.03 (Silvex)
YAKIMA RIVER AT KIONA, WASHINGTON	
04/09/69	.20 (2,4-D)
05/19/69	.01 (DDD); .01 (DDE); .04 (DDT); .24 (2,4-D)
06/27/69	.01 (DDE); .04 (DDT); .01 (Dieldrin); .21 (2,4-D)
07/30/69	.01 (DDD); .03 (DDT); .02 (Dieldrin; .18 (2,4-D)
08/21/69	.01 (DDD); .01 (DDE); .02 (DDT); .01 (Dieldrin); .09 (2,4-D)
09/09/69	.09 (2,4-D)
10/17/69	.01 (DDT); .04 (2,4-D)
12/30/69	.05 (2,4-D)
01/27/70	.04 (2,4-D)
02/16/70	.01 (Dieldrin); .04 (2,4-D)
04/28/70	.01 (DDT); .05 (2,4-D)
05/25/70	.01 (DDD); .01 (DDE); .02 (DDT); .42 (2,4-D); .01 (2,4,5-T)
06/22/70	.02 (DDD); .01 (DDE); .02 (DDT); .01 (Dieldrin); .15 (2,4-D); .01 (2,4,5-T)
07/20/70	.01 (Dieldrin); .16 (2,4-D); .01 (2,4,5-T)
08/24/70	.01 (DDD); .01 (DDE); .18 (2,4-D)
10/15/70	.04 (2,4-D)
01/22/71	.06 (2,4-D); .01 (2,4,5-T)
03/07/71	.01 (DDT)
04/21/71	.01 (DDT); .07 (2,4-D)
07/16/71	.01 (DDT); .27 (2,4-D)
08/06/71	.02 (DDE); .01 (DDT); .01 (Dieldrin); .18 (2,4-D)
SNAKE RIVER AT KING HILL, IDAHO	
10/01/68	.02 (DDT)
01/20/69	.04 (2,4,5-T)
05/23/69	.09 (2,4-D)
07/14/69	.06 (2,4-D)
08/11/69	.02 (DDT); .03 (2,4-D)
09/08/69	.03 (DDT); .05 (2,4-D)
10/06/69	.05 (DDT); .04 (2,4-D)
12/15/69	.01 (DDD); .03 (DDT); .01 (Dieldrin); .02 (2,4-D)
01/13/70	.12 (DDT)
02/09/70	.01 (DDT)
03/15/70	.03 (DDT)
04/20/70	.01 (DDT); .16 (Lindane)
05/11/70	.01 (DDT)
06/08/70	.04 (2,4-D)
07/11/70	.01 (DDT); .06 (2,4-D)
08/09/70	.04 (2,4-D)
09/18/70	.01 (DDT)
10/05/70	.04 (2,4-D)
11/20/70	.01 (DDT)
01/08/71	.01 (2,4,5-T)
03/29/71	.02 (2,4,5-T)
08/02/71	.02 (2,4-D)
COLUMBIA RIVER AT THE DALLES, OREGON	
12/09/68	.26(2,4-D); .07 (2,4,5-T)
10/21/69	.01 (2,4-D)
06/26/70	.25 (2,4-D)
03/09/71	.01 (DDT)

TABLE 7

PESTICIDE RESIDUES IN FISH, 1967-1971

(μg/g)

Station No.	Station Location and Fish Species	D. D. E.				T. D. E.				D. D. T.				D. D. T. & Met.			
		1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971
ATLANTIC COAST STREAMS																	
1	Stillwater River																
	Old Town, Maine																
	1) White Sucker	.09	.04	.05		.07	.05	.05		.06	.06	.05		.22	.14	.13	
	2) Yellow Perch	.09	.05	.10		.06	.04	.06		.07	.05	.06		.22	.14	.22	
	3) White Perch	.19				.15				.09				.43			
	4) Chain Pickerel	.06	.06	.06		.04	.03	.09		.03	.05	.08		.12	.14	.23	
2	Connecticut River																
	Windsor Locks, Connecticut																
	1) White Catfish	.53	1.29	.38		.68	1.37	.43		.50	1.16	.31		1.71	3.82	1.12	
	2) Brown Bullhead		.04				.09				.12				.25		
	3) Yellow Perch	.34		.49		.47		.51		.41		.60		1.22		1.60	
	4) White Perch	.24	1.17	.64		.42	.76	.65		.46	.78	.63		1.12	2.71	1.92	
3	Hudson River																
	Poughkeepsie, N. Y.																
	1) Goldfish	.82	5.02	1.24		1.21	5.89	1.91		.52	3.49	.65		2.55	14.40	3.80	
	2) Pumpkinseed	.15	1.54	.23		.29	1.72	.39		.18	1.15	.23		.62	4.41	.85	
	3) Largemouth Bass	.95	3.70	1.34		1.31	4.61	1.22		.92	3.18	.34		3.18	11.49	3.30	
4	Delaware River																
	Camden, N. J.																
	1) White Sucker	2.08	2.76	4.82		1.92	2.03	3.45		.58	.66	.59		4.58	5.45	8.86	
	2) Brown Bullhead	2.89	2.68	1.65		3.15	2.89	1.76		.31	.52	.30		6.35	6.09	3.71	
	3) White Perch	18.40	18.20	10.90		16.60	13.00	8.07		1.73	2.92	1.30		36.73	34.12	20.27	
5	Susquehanna River																
	Conowingo, Maryland																
	1) Carp	.03	.41	.24		.02	.40	.18		1.51	.30	.09		1.56	1.11	.51	
	2) Channel Catfish	.01	.31	.30		.09	.24	.30		.01	.20	.18		.10	.75	.78	
	3) Yellow Perch	-	.48	.31		.05	.30	.24		.01	.30	.20		.06	1.08	.75	
6	Potomac River																
	Little Falls, Maryland																
	1) Carp	.05	.78	.38		.15	.78	.43		-	.27	.18		.20	1.83	.99	
	2) White Sucker	.03	.18	.10		.07	.17	.12		.18	.19	.11		.20	.54	.33	
	3) Smallmouth Bass	.02				.06				.03				.11			
	4) Largemouth Bass		.66	.17			.55	.17			.57	.14			1.78	.48	
7	Roanoke River																
	Roanoke Rapids, N. C.																
	1) Carp	.01				.10				-				.11			
	2) Redhorse (Sucker)		.29	.36			.31	.44			.26	.25			.86	1.05	
	3) Lake Chubsucker	.02				-				.08				.10			
	4) Brown Bullhead	.01	.23	.26		.06	.14	.16		-	.07	.08		.07	.44	.50	
	5) Largemouth Bass	.07	.56	.72		.16	.45	.35		.09	.39	.31		.32	1.40	1.38	

TABLE 7 (Continued)

PESTICIDE RESIDUES IN FISH, 1967-1971

(µg/g)

Station No.	Station Location and Fish Species	D. D. E.				T. D. E.				D. D. T.				D. D. T. & Rel.			
		1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971
8	Cape Fear River Elizabethtown, N. C.																
	1) Gizzard Shad	.02		.27		.69		.37		.35		.15		1.06		.79	
	2) Channel Catfish		.49	1.03			.71	1.28			.58	.45			1.78	2.76	
	3) Brown Bullhead	.02	.05	.23		.08	.07	.28		.03	.07	.14		.13	.19	.65	
	4) Largemouth Bass	.02	.52			.19	.73			.21	.48			.43	1.73		
9	Cooper River Summerton, S. C.																
	1) Spotted Sucker	.04	.73	.29		.06	.76	.19		.07	.62	.14		.16	2.11	.62	
	2) Bluegill	.02	.61	.36		.02	.34	.14		.06	.62	.24		.10	1.57	.74	
	3) Largemouth Bass	.09	1.65	1.63		.17	1.02	.68		.16	1.39	1.56		.42	4.06	3.87	
10	Savannah River Savannah, Georgia																
	1) Carp	-	.27	.30		.06	.30	.21		.01	.24	.14		.07	.81	.65	
	2) Striped Mullet		.20				.30				.25				.75		
	3) Bluegill	-		.22		.07		.15		-		.11		.07		.48	
	4) Largemouth Bass	.02	.08	.37		-	.07	.20		.08	.07	.19		.10	.22	.76	
11	St. Johns River Welaka, Florida																
	1) Striped Mullet	.02	.14			-	.16			.09	.15			.11	.45		
	2) Channel Catfish	.01	.05	.04		.04	.08	.04		.06	.04	.02		.11	.17	.10	
	3) Redbreast Sunfish	.01	.05	.02		.14	.06	.02		.04	.04	.03		.19	.15	.07	
	4) Largemouth Bass	.02		.12		.09		.11		.04		.06		.15		.29	
12	St. Lucie Canal Indiantown, Florida																
	1) White Catfish	.03				.06				.03				.12			
	2) Channel Catfish		3.07	42.3			2.50	10.40			1.69	5.07			7.26	57.77	
	3) Bluegill	-	.76	.81		.16	.60	.45		.02	.68	.24		.18	2.84	1.50	
	4) Largemouth Bass	.01	.57	.20		.14	.52	.21		.06	.67	.18		.25	1.76	.51	
GULF COAST STREAMS																	
13	Apalachicola River Jim Woodruff Dam, Florida																
	1) Spotted Sucker	.24	1.83	.45		.06	.67	.32		3.24	.44	.14		3.54	2.94	.91	
	2) Channel Catfish	.02	2.68	.56		.33	1.64	.65		.04	1.72	.16		.39	6.84	1.37	
	3) Largemouth Bass	.07	1.68	1.26		.01	1.32	.99		1.03	.80	.44		1.11	3.80	2.69	

TABLE 7 (Continued)

PESTICIDE RESIDUES IN FISH, 1967-1971

(ppm/g)

Station No.	Station Location and Fish Species	D. D. E.				T. D. E.				D. D. T.				D. D. T. & Met.			
		1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971
14	Tombigbee River McIntosh, Alabama																
	1) Carp	.04	9.48	2.93		.09	4.82	.74		.03	1.33	.14		.16	15.63	3.81	
	2) Striped Mullet	.01	3.28	4.55		.10	2.21	2.26		.03	1.26	1.12		.14	6.75	7.93	
	3) Largemouth Bass	-	7.94	5.85		.10	3.70	2.73		.03	1.69	1.57		.13	13.33	10.15	
15	Mississippi River Luling, La.																
	1) Carp	.01	.07	.06		.05	.19	.16		.02	.06	.07		.08	.32	.29	
	2) Striped Mullet	-	.29	.08		.03	.44	.20		.01	.78	.30		.04	1.51	.58	
	3) Channel Catfish	-	.24	.09		.06	.45	.22		-	.53	.15		.06	1.22	.46	
16	Rio Grande River Brownsville, Texas																
	1) Gizzard Shad	.05	2.34	1.54		.03	.16	.73		.03	.13	.13		.11	2.63	2.40	
	2) Channel Catfish	.03	.61	2.93		.01	.01	.11		.02	.02	.07		.06	.64	3.11	
	3) Flathead Catfish	.08				.37				.05				.20			
	4) Blue Catfish		10.70	1.87			1.30	.08			1.17	.04			13.17	1.99	
GREAT LAKES DRAINAGE																	
17	Genesee River Scottsville, N. Y.																
	1) White Sucker	.06	.10	.22		.06	.08	.34		.08	.10	.19		.20	.28	.75	
	2) Rock Bass		.15	.08			.15	.05			.13	.06			.43	.19	
	3) Walleye	1.27	.76	.42		1.57	.81	.29		1.39	.44	.20		4.23	2.01	.91	
18	Lake Ontario Port Ontario, N. Y.																
	1) Yellow Perch	1.60	2.81	.75		.90	2.35	.71		1.23	2.53	.67		3.73	7.89	2.13	
	2) White Perch	.55	4.84	1.95		.31	3.36	1.47		.47	3.59	1.11		1.33	11.79	4.53	
	3) Rock Bass	.43	2.97	.60		.27	2.14	.59		.28	2.14	.49		.98	7.25	1.68	
19	Lake Erie Erie, Pennsylvania																
	1) White Sucker	.09	.23	.43		.11	.27	.51		.13	.43	.42		.33	.93	1.36	
	2) Freshwater Drum	.09	.25	.26		.10	.41	.28		.13	.56	.31		.32	1.22	.85	
	3) Yellow Perch	.23	.11	.35		.17	.30	.31		.26	.58	.42		.66	.99	1.08	
20	Lake Huron Bayport, Michigan																
	1) Carp	.21	.15	.30		.28	.19	.43		.09	.08	.14		.58	.42	.87	
	2) Channel Catfish	1.08	1.63	.70		1.13	1.80	.77		.30	1.29	.41		2.51	4.72	1.88	
	3) Yellow Perch	.59	.25	.48		.57	.32	.68		.43	.16	.36		1.59	.73	1.52	

TABLE 7 (Continued)

PESTICIDE RESIDUES IN FISH, 1967-1971

(µg/g)

Station No.	Station Location and Fish Species	D. D. E. 1967	D. D. E. 1968	D. D. E. 1969	D. D. E. 1971	T. D. E. 1967	T. D. E. 1968	T. D. E. 1969	T. D. E. 1971	D. D. T. 1967	D. D. T. 1968	D. D. T. 1969	D. D. T. 1971	D. D. T. & Met. 1967	D. D. T. & Met. 1968	D. D. T. & Met. 1969	D. D. T. & Met. 1971
21	Lake Michigan																
	Sheboygan, Wisconsin																
	1) Bloater	3.55	3.26	3.52		.35	.59	.74		1.97	2.58	1.80		5.87	6.43	6.06	
	2) White Sucker			2.30				3.81				2.50				8.61	
	3) Yellow Perch			2.41				1.47				2.56				6.44	
22	Lake Superior																
	Bayfield, Wisconsin																
	1) Bloater			1.07				.15				.59				1.81	
	2) Lake Whitefish			.34				.12				.28				.74	
	3) Round Whitefish	.44	.29			.04	.04			.15	.12			.63	.45		
	4) Lake Trout	.51	.78	.98		.04	.14	.15		.25	.46	.45		.80	1.38	1.58	
	MISSISSIPPI RIVER SYSTEM																
23	Kanawha River																
	Winfield, Virginia																
	1) Carp	.03	.34	.08		.06	.57	.19		.02	.46	-		.11	1.37	.27	
	2) Channel Catfish	.07				.13				.11				.31			
	3) Brown Bullhead	.05	.47	.17		.10	.66	.40		.05	.31	.09		.20	1.44	.66	
	4) White Crappie		.36	.03			.46	.25			.34	.09			1.16	.37	
24	Ohio River																
	Marietta, Ohio																
	1) Carp	.06	.77	.39		.12	.38	.36		.08	.37	.21		.26	1.52	.96	
	2) Redhorse (Sucker)	.12	.20	.17		.25	.35	.30		.07	.22	.19		.44	.77	.66	
	3) Channel Catfish	.64	1.29	.75		.89	1.24	1.65		.72	.78	.89		2.26	3.31	3.20	
	4) Largemouth Bass			1.69				1.76				.74				4.19	
25	Cumberland, River																
	Clarksville, Tennessee																
	1) Carp	.02	.30	.29		.04	.38	.26		.05	.18	.11		.11	.86	.66	
	2) Bluegill	.04	.31	.21		-	.26	.22		.13	.16	.16		.17	.73	.59	
	3) Largemouth Bass	.01	.67	.59		.03	.85	.58		.01	.56	.37		.05	2.08	1.54	
26	Illinois River																
	Beardstown, Illinois																
	1) Bigmouth Buffalo	.04	.17	.15		.08	.22	.17		.04	.21	.11		.16	.60	.43	
	2) Black Bullhead	.06	.30			.13	.45			.06	.40			.25	1.15		
	3) White Crappie	.06	.19	.23		.09	.25	.27		.04	.28	.15		.19	.72	.65	
	4) Carp			1.74				1.96				.96				4.56	

TABLE 7 (Continued)

PESTICIDE RESIDUES IN FISH, 1967-1971

(µg/g)

Station No.	Station Location and Fish Species	D. D. E.				T. D. E.				D. D. T.				D. D. T. & Met.			
		1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971
27	Mississippi River																
	Guttenberg, Iowa																
	1) Carp		.30	.06			.38	.09			.27	.05			.95	.20	
	2) Bigmouth Buffalo	.05				.09				.07				.21			
	3) Redhorse (Sucker)		.26				.36				.35				.97		
	4) Bluegill	.08	.10	.04		.12	.14	.03		.10	.17	.04		.30	.41	.11	
	5) Largemouth Bass	.04	.14	.10		.03	.21	.17		.03	.22	.14		.10	.57	.41	
28	Arkansas River																
	Pine Bluff, Arkansas																
	1) Carp	.01	5.63	1.20		.01	2.79	.41		1.57	.67	.30		1.59	9.09	1.91	
	2) Smallmouth Buffalo	.08	1.83	.46		.64	2.03	.46		.39	1.95	.50		1.11	5.81	1.42	
	3) Channel Catfish		.89				.78				1.02				2.69		
	4) Flathead Catfish	.05		.82		.03		.80		1.16		.60		1.24		2.22	
29	Arkansas River																
	Keystone Res., Oklahoma																
	1) Carp	.01	.15	.07		.06	.13	.04		.02	.10	.03		.08	.38	.14	
	2) Bluegill	-	.17	.15		.01	.10	.09		.02	.10	.11		.02	.37	.35	
	3) Largemouth Bass	-	.15	.12		.17	.14	.12		.02	.11	.10		.19	.40	.34	
30	White River																
	DeValls Bluff, Arkansas																
	1) Carp	.01	1.56	.75		.01	1.30	.58		1.73	.32	.08		1.75	3.18	1.41	
	2) Bigmouth Buffalo	.05	2.19	.62		.02	2.21	.60		.42	2.32	.51		.49	6.72	1.73	
	3) Channel Catfish	-	2.82	.49		.09	2.21	.23		.02	2.73	.19		.10	7.75	.91	
31	Missouri River																
	Nebraska City, Nebraska																
	1) Carp	.14	.27	.25		.16	.28	.57		.11	.24	.40		.41	.81	1.22	
	2) Channel Catfish	.43	.15	.06		.73	.22	.08		.87	.26	.06		2.03	.63	.20	
	3) White Crappie	.09				.06				.06				.21			
	4) Walleye		.02				.20				.22				.44		
	5) Goldeye			.23				.22				.20				.65	
32	Missouri River																
	Garrison Dam, North Dakota																
	1) Carp	.03	.08	.03		.02	.06	.02		.01	.07	.01		.06	.21	.06	
	2) White Sucker	.02				.02				.01				.05			
	3) Goldeye	.03	.05	.03		.02	.04	.02		.03	.05	.02		.08	.14	.07	
	4) Walleye		.06	.05			.09	.03			.08	.04			.23	.12	

TABLE 7 (Continued)

PESTICIDE RESIDUES IN FISH, 1967-1971

(µg/g)

Station No.	Station Location and Fish Species	D. D. E.				T. D. E.				D. D. T.				D. D. T. & Met.			
		1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971
33	Missouri River																
	Great Falls, Montana																
	1) Largescale Sucker	-				-				-				.01			
	2) Redhorse (Sucker)		.75	.03			.67	.03			.96	.02			2.38	.08	
	3) Goldeye		.09	.29			.08	.28			.16	.34			.33	.91	
	4) Channel Catfish		.74				.50				.57				1.81		
	5) Yellow Perch	.03				.03				.02				.08			
	6) Rainbow Trout	.01				.01				-				.01			
	HUDSON BAY DRAINAGE																
34	Red River																
	Koyce, Minnesota																
	1) White Sucker	.61	.17	.08		.95	.09	.07		1.79	.37	.07		3.35	.43	.22	
	2) Goldeye	1.04	1.90			.52	.25			.69	.21			2.25	2.36		
	3) Sauger	1.16	.39	.38		.75	.30	.10		1.8/	.37	.18		3.78	1.06	.66	
	COLORADO RIVER SYSTEM																
35	Green River																
	Vernal, Utah																
	1) Carp	.01	.04	.04		.02	.03	.08		.02	.03	.07		.05	.10	.19	
	2) Channel Catfish	-				.05				.01				.06			
	3) Black Bullhead	.01	.02	.03		.39	.02	.02		.10	.02	.01		.50	.06	.06	
	4) Green Sunfish		.03				.02				.02				.07		
	5) Flannelmouth Sucker			.13				.28				.19				.60	
36	Colorado River																
	Imperial Res., Arizona																
	1) Carp	.04	.18	.26	.05	.01	-	.05		2.71	-	.03	.01*	2.76	.18	.34	
	2) Channel Catfish	.03		.61		-		.09		4.75		.10		4.79		.80	
	3) Bluegill		.06				-				-				.06		
	4) Largemouth Bass	.02	.09	.12	.59	.01	-	.04		.01	-	.06	.03*	.04	.09	.22	
	5) Redear Sunfish	.01			.52								.01*				
	INTERIOR BASINS																
37	Truckee River																
	Fernley, Nevada																
	1) Carp	.02	.25	.13		.01	.17	.06		.01	.06	.05		.03	.48	.34	
	2) Largescale Sucker	.02				.01				-				.02			
	3) Brown Bullhead		.09	.08			.08	.07			.05	.06			.22	.21	
	4) Largemouth Bass		.42	.19			.35	.18			.35	.10			1.12	.47	

*p,p'-DDT

TABLE 7 (Continued)

PESTICIDE RESIDUES IN FISH, 1967-1971

(µg/g)

Station No.	Station Location and Fish Species	D. D. E.				T. D. E.				D. D. T.				D. D. T. & Met.			
		1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971
38	Utah Lake Provo, Utah																
	1) Carp	-	.06	.10		.07	.06	.06		.01	.02	.04		.08	.14	.22	
	2) Brown Bullhead	-	.02			.05	.03			.01	.02			.06	.07		
	3) White Bass	.01	.08	.13		.13	.09	.09		.06	.06	.21		.20	.23	.43	
	4) Black Bullhead			.04				.05				.03				.12	
CALIFORNIA STREAMS																	
39	Sacramento River Sacramento, California																
	1) Carp	.86	.81	.94		.57	.28	.32		.07	.28	.08		1.50	1.37	1.34	
	2) Channel Catfish		1.19				.81				.53				2.53		
	3) Brown Bullhead	1.36				1.01				.31				2.68			
	4) Largemouth Bass		1.17	.30			1.03	.18			1.26	.16			3.46	.64	
	5) Northern Squawfish	.24				.12				.05				.40			
	6) White Catfish			.86				.32				.21				1.39	
40	San Joaquin River Los Banos, California																
	1) Carp	.09	.19	.86		.04	.18	.40		-	.07	.14		.13	.44	1.40	
	2) Channel Catfish	1.29	1.15	.78		.51	1.33	.58		.01	.30	.21		1.80	2.78	1.57	
	3) Black Crappie	.02	.48	.62		.02	.65	.49		.01	.37	.25		.05	1.50	1.36	
COLUMBIA RIVER SYSTEM																	
41	Snake River Hagerman, Idaho																
	1) Largescale Sucker	.08	.60	.33		.02	.23	.12		.02	.18	.05		.12	1.01	.50	
	2) Mountain Whitefish	.01				-				-				.02			
	3) Rainbow Trout	.07		.50		-		.16		.01		.07		.08		.73	
	4) Northern Squawfish	.60	1.43	.94		.05	.16	.11		-	.09	.08		.66	1.67	1.13	
42	Snake River Lewiston, Idaho																
	1) Carp	.09				.02				.01				.11			
	2) Largescale Sucker	.05	.31	.12		.03	.17	.08		.05	.26	.07		.13	.74	.27	
	3) Channel Catfish	.39				.07				.10				.56			
	4) Smallmouth Bass		.30	.30			.11	.14			.14	.16			.55	.60	
	5) Northern Squawfish	.22	.44	.48		.04	.12	.03		.02	.14	.05		.28	.70	.56	

TABLE 7 (Continued)

PESTICIDE RESIDUES IN FISH, 1967-1971

(µg/g)

Station No.	Station Location and Fish Species	D. D. E.				T. D. E.				D. D. T.				D. D. T. & Met.			
		1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971
43	Salmon River																
	Riggins, Idaho																
	1) Largescale Sucker	.03	.19	.14		-	.08	.06		.01	.11	.09		.04	.38	.29	
	2) Smallmouth Bass	.08				-				.04				.12			
	3) Northern Squawfish	.10				.02				-				.12			
44	Yakima River																
	Grainger, Washington																
	1) Carp	1.36	2.73			.50	.89			.22	.33			2.08	3.95		
	2) Largescale Sucker	.23		.47		.03		.29		.08		.45		.33		1.21	
	3) Chiselmouth		1.09				.25				.32				1.66		
	4) Black Crappie		.99	.94			.50	.22			.09	.25			1.58	1.41	
	5) Northern Squawfish	1.01				.33				.04				1.38			
	6) Smallmouth Bass			.94				.23				.20				1.37	
45	Willamette River																
	Oregon City, Oregon																
	1) Carp	.12				.12				.03				.27			
	2) Largescale Sucker	1.85	.31	.15		.28	.39	.25		.52	.40	.14		2.65	1.10	.54	
	3) Coho Salmon	.34				.01				-				.35			
	4) Northern Squawfish	.14	.62			.10	.29			-	.41			.25	1.32		
	5) Chiselmouth			.14				.09				.07				.30	
	6) White Crappie			.22				.22				.10				.54	
46	Columbia River																
	Bonneville Dam, Oregon																
	1) Carp		3.41				.39				.23				4.03		
	2) Largescale Sucker	-		.36		.02		.17		.02		.11		.04		.64	
	3) Rainbow Trout	.09				.01				-				.10			
	4) Northern Squawfish	.01	1.93	1.87		.45	.99	.45		.04	.32	.10		.50	3.24	2.42	
	5) Chiselmouth			.70				.41				.09				1.20	
	PACIFIC COAST STREAMS																
47	Klamath River																
	Hornbrook, California																
	1) Klamath Sucker		.03	.02			.02	.01			.01	.02			.06	.05	
	2) Pumpkinseed		.02				.02				.01				.04		
	3) Yellow Perch	.18	.02	.03		.10	.02	.03		.05	.02	.03		.33	.06	.09	
	4) Rainbow Trout	.03		.08		-		.03		.02		.03		.04		.14	

TABLE 7 (Continued)

PESTICIDE RESIDUES IN FISH, 1967-1971

(µg/g)

Station No.	Station Location and Fish Species	D. D. E.				T. D. E.				D. D. T.				D. D. T. & Met.			
		1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971
48	Rogue River																
	Gold Ray Dam, Oregon																
	1) Bridgelip Sucker	.07	.39	.35		.04	.50	.38		.07	.62	.38		.18	1.51	1.11	
	2) Brown Bullhead	.02		.86		-		1.01		-		.42		.02		2.29	
	3) Largemouth Bass	.15				.10				.22				.46			
	4) Smallmouth Bass		.34				.47				.44				1.25		
	5) Rainbow Trout		1.33				.75				.77				2.85		
	6) Black Crappie			.40				.35				.22				.97	
ALASKA STREAMS																	
49	Chena River																
	Fairbanks, Alaska																
	1) Longnose Sucker	.04	.24	.54		.02	.21	.52		.06	.45	.10		.12	.90	1.16	
	2) Lake Whitefish	.09				.06				.10				.24			
	3) Round Whitefish		.19	.27			.22	.31			.53	.34			.94	.92	
	4) Artic Grayling		.33	.25			.34	.16			.94	.21			1.61	.62	
	5) Coho Salmon	.02				-				.01				.03			
50	Kenai River																
	Soldatna, Alaska																
	1) Longnose Sucker	-	-	.01		-	-	.01		-	-	.01		-	-	.03	
	2) Round Whitefish		-				.01				.03				.04		
	3) Rainbow Trout	-		.08		-		.03		-		.03		-		.14	
	4) Lake Trout		.05	.04			.03	.02			.07	.03			.15	.09	
	5) Sockeye Salmon	-				-				-				-			

TABLE 7 (Continued)

PESTICIDE RESIDUES IN FISH, 1967-1971
(µg/g)

Station No.	Station Location and Fish Species	Dieldrin				Aldrin				Endrin				Lindane				Heptachlor			
		1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971
ATLANTIC COAST STREAMS																					
1	Stillwater River Old Town, Maine																				
	1) White Sucker	.03	-	.01		-	-			-	-			.36	-			-	-		
	2) Yellow Perch	.02	-	.02		-	-			-	-			.27	-			-	-		
	3) White Perch	.01				-				-				-				-			
	4) Chain Pickerel	.01	-	.02		-	-			-	-			.10	-			-	-		
2	Connecticut River Windsor Locks, Connecticut																				
	1) White Catfish	1.58	.37	.50		-	-			-	-			-	-			-	-		
	2) Brown Bullhead		.16				.03				-				-				.04		
	3) Yellow Perch	1.94		.20		-				-				-				-			
	4) White Perch	1.21	.30	.26		-	-			-	-			-	-			-	-		
3	Hudson River Poughkeepsie, New York																				
	1) Goldfish	.35	.22	.04		-	-			-	-			-	-			-	-		
	2) Pumpkinseed	.10	.09	.05		-	-			-	-			-	-			-	-		
	3) Largemouth Bass	.18	.14	.16		-	-			-	-			-	-			-	-		
4	Delaware River Camden, New Jersey																				
	1) White Sucker	.35	.10	.35		-	-			-	-			.04	-			-	-		
	2) Brown Bullhead	.39	.17	.25		-	-			-	-			.08	-			-	-		
	3) White Perch	1.24	.25	.56		-	-			-	-			.05	-			-	-		
5	Susquehanna River Conowingo, Maryland																				
	1) Carp	.05	.08	.06		-	-			1.30	-			-	-			.01	-		
	2) Channel Catfish	-	.12	.16		-	-			-	-			-	-			-	-		
	3) Yellow Perch	.01	.10	.13		-	-			.01	-			-	-			-	-		
6	Potomac River Little Falls, Maryland																				
	1) Carp	.02	.07	.05		.01	-			-	-			.01	-			-	-	-	
	2) White Sucker	.01	.07	.04		.01	-			-	-			-	-			-	-		
	3) Smallmouth Bass	.01				-				.01				-				-			
	4) Largemouth Bass		.06	.03			-				-				-				-		
7	Roanoke River Roanoke Rapids, N. C.																				
	1) Carp	-				-				.01				.01				-			
	2) Redhorse (Sucker)		.07	.12			-				-				-				-		
	3) Lake Chubsucker	-				-				-				.01				.01			
	4) Brown Bullhead	-	.02	.03		-	-			.03	-			-	-			.01	-		
	5) Largemouth Bass	.01	.06	.10		-	-			-	-			.01	-			.01	-		
8	Cape Fear River Elizabethtown, N. C.																				
	1) Gizzard Shad	-		.05		-				-				.01				-			
	2) Channel Catfish		.07	.07			-				-				-				-		
	3) Brown Bullhead	-	.02	.02		-	-			.01	-			-	-			-	-		
	4) Largemouth Bass	.05	.07			-	-			-	-			-	-			.01	-		

TABLE 7 (Continued)

PESTICIDE RESIDUES IN FISH, 1967-1971
(µg/g)

Station No.	Station Location and Fish Species	Dieldrin				Aldrin				Endrin				Lindane				Heptachlor			
		1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971
9	Cooper River																				
	Summerton, S. C.																				
	1) Spotted Sucker	.01	.02	-		-	-			.04	-			.01	-			.01	-		
	2) Bluegill	-	-	.01		-	-			.01	-			.01	-			.01	-		
	3) Largemouth Bass	-	-	.01		-	-			-	.01			.01	-			.01	-		
10	Savannah River																				
	Savannah, Georgia																				
	1) Carp	-	.52	.54		-	-			-	.02			-	-			-	-		
	2) Striped Mullet		1.37				-				.03				-				-		
	3) Bluegill	-		.55		-				-				-				-			
	4) Largemouth Bass	-	.15	.34		-	-			-	-			.03	-			.02	-		
11	St. Johns River																				
	Welaka, Florida																				
	1) Striped Mullet	-	-			-	-			.02	-			-	-			-	-		
	2) Channel Catfish	-	-	.01		-	-			-	-			.01	-			-	-		
	3) Redbreast Sunfish	.01	-	.01		-	-			-	-			.01	-			.01	-		
	4) Largemouth Bass	-		.01		-				-				-				.01			
12	St. Lucie Canal																				
	Indiantown, Florida																				
	1) White Catfish	-				-				-				-				-			
	2) Channel Catfish		-	.06			-				-				-				-		
	3) Bluegill	-	.04	.01		-	-			.01	-			-	-			-	-		
	4) Largemouth Bass	-	-	.02		-	-			-	-			-	-			-	-		
GULF COAST STREAMS																					
13	Apalachicola River																				
	Jim Woodruff Dam, Florida																				
	1) Spotted Sucker	.02	.15	.30		.02	-			.27	-			-	-			.01	-		
	2) Channel Catfish	.02	-	.36		-	-			-	-			-	-			-	-		
	3) Largemouth Bass	.01	.45	1.59		-	-			.06	-			-	-			-	-		
14	Tombigbee River																				
	McIntosh, Alabama																				
	1) Carp	-	.01	.01		-	-			-	-			-	.37			-	-		
	2) Striped Mullet	-	.04	.02		-	-			-	-			-	-			-	-		
	3) Largemouth Bass	-	.06	.03		-	-			-	-			-	-			-	-		
15	Mississippi River																				
	Luling, Louisiana																				
	1) Carp	.01	.09	.13		.01	-			.01	.10			-	-			-	-	-	
	2) Striped Mullet	-	.18	.39		-	-			.01	.14			-	-			.01	.09	-	
	3) Channel Catfish	-	.17	.12		-	-			-	.14			-	-			-	-	-	
16	Rio Grande River																				
	Brownsville, Texas																				
	1) Gizzard Shad	-	-	.50		-	-			-	-			-	.02			-	-		
	2) Channel Catfish	-	-	.01		-	-			-	-			-	-			-	-		
	3) Flathead Catfish	.01				-				-				-				-			
	4) Blue Catfish		.01	-			-				.02				.02				-		

TABLE 7 (Continued)

PESTICIDE RESIDUES IN FISH, 1967-1971
(µg/g)

Station No.	Station Location and Fish Species	Dieldrin				Aldrin				Endrin				Lindane				Heptachlor			
		1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971
GREAT LAKES DRAINAGE																					
17	Genesee River																				
	Scottsville, New York																				
	1) White Sucker	.02	.02	.02		-	-			-	-			.01	-			-	-	-	
	2) Rock Bass		.03	-			-				-				-				-		
	3) Walleye	.11	.10	.03		-	-			-	-			.01	-			-	-	-	
18	Lake Ontario																				
	Port Ontario, New York																				
	1) Yellow Perch	.01	.05	.10		-	-			-	.02			.36	-			-	-		
	2) White Perch	.04	.09	.06		-	-			-	.02			.06	-			-	-		
	3) Rock Bass	.03	.03	.07		-	-			-	-			.09	-			-	-		
19	Lake Erie																				
	Erie, Pennsylvania																				
	1) White Sucker	.03	.02	.04		-	-			-	-			.01	-			-	-		
	2) Freshwater Drum	.03	.07	.04		-	-			-	-			-	-			-	-		
	3) Yellow Perch	.04	.05	.04		-	-			-	-			.01	-			-	-		
20	Lake Huron																				
	Bayport, Michigan																				
	1) Carp	.01	-	.02		-	-			-	-			.01	-			-	-		
	2) Channel Catfish	.04	.04	.04		-	-			-	-			.03	.29			-	-		
	3) Yellow Perch	.04	-	.02		-	-			-	-			.01	-			-	-		
21	Lake Michigan																				
	Sheboygan, Wisconsin																				
	1) Bloater	.22	.16	.37		-	-			-	-			.01	-			-	-		
	2) White Sucker			.03																	
	3) Yellow Perch			.06																	
22	Lake Superior																				
	Bayfield, Wisconsin																				
	1) Bloater			.02																	
	2) Lake Whitefish			.03																	
	3) Round Whitefish	.01	-			-	-			-	-			.01	-			-	-		
	4) Lake Trout	.03	.03	.02		-	-			-	-			.01	-			-	-		
MISSISSIPPI RIVER SYSTEM																					
23	Kanawha River																				
	Winfield, Virginia																				
	1) Carp	.02	.03	.02		-	-			-	-			-	.48			-	.72		
	2) Channel Catfish	.05				-				-				-				-			
	3) Brown Bullhead	.04	.03	.02		-	-			-	-			-	.36			-	.64	-	
	4) White Crappie		.03	.02			-				-				.32				.65	-	
24	Ohio River																				
	Marietta, Ohio																				
	1) Carp	.02	.03	.04		-	-			-	-			.10	-			-	-	-	
	2) Redhorse (Sucker)	.02	.03	.02		-	-			-	-			.16	-			-	-	-	
	3) Channel Catfish	.05	.03	.05		-	-			-	-			.27	-			-	-	-	
	4) Largemouth Bass			.07																-	

TABLE 7 (Continued)

PESTICIDE RESIDUES IN FISH, 1967-1971
(µg/g)

Station No.	Station Location and Fish Species	Dieldrin				Aldrin				Endrin				Lindane				Heptachlor			
		1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971
25	Cumberland River Clarksville, Tennessee																				
	1) Carp	-	.02	.02		-	-			.01	-			.01	-			-	-		
	2) Bluegill	-	.03	.03		-	-			.01	-			.02	-			-	-		
	3) Largemouth Bass	-	.04	.02		-	-			.02	.01			.01	-			-	-		
26	Illinois River Beardstown, Illinois																				
	1) Bigmouth Buffalo	.52	.35	.42		-	-			-	-			.02	.07			-	-		
	2) Black Bullhead	.18	.30			-	-			-	-			-	.05			-	-		
	3) White Crappie	.23	.27	.27		-	-			-	-			-	.04			-	-		
	4) Carp			.49																	
27	Mississippi River Gutenberg, Iowa																				
	1) Carp		.04	.01			-				-				-				-		
	2) Bigmouth Buffalo	.04				-				-				.02				-			
	3) Redhorse (Sucker)		.05				-				-				-				-		
	4) Bluegill	.03	.02	.01		-	-			-	-			-	-			-	.01		
	5) Largemouth Bass	.02	.02	.01		-	-			-	-			-	-			-	-		
28	Arkansas River Pine Bluff, Arkansas																				
	1) Carp	.03	.02	.01		-	-			.04	-			-	-			.01	-		
	2) Smallmouth Buffalo	.02	.05	.12		.01	-			.11	-			.02	-			.04	-	-	
	3) Channel Catfish		.02				-				-				-				-		
	4) Flathead Catfish	.02		.03		-				.11				.01				.01			
29	Arkansas River Keystone Reservoir, Okla.																				
	1) Carp	-	.01	.01		-	-			-	-			-	-			-	.02		
	2) Bluegill	-	-	.02		-	-			-	-			-	-			-	.02		
	3) Largemouth Bass	.01	.03	.03		-	-			.01	-			-	-			.01	-		
30	White River DeValls Bluff, Arkansas																				
	1) Carp	.01	.04	.05		-	-			.01	.06			-	-			-	-		
	2) Bigmouth Buffalo	-	.04	.04		-	-			.01	.06			-	-			.01	-		
	3) Channel Catfish	-	.06	.02		-	-			-	.02			-	-			-	-		
31	Missouri River Nebraska City, Nebraska																				
	1) Carp	.11	.09	.02		-	-			-	-			.01	-			-	-		
	2) Channel Catfish	.12	.04	.03		-	-			-	-			.02	-			-	-		
	3) White Crappie	.06				-				-				.01				-			
	4) Walleye		.24				-				-				-				-		
	5) Goldeye			.08																	
32	Missouri River Garrison Dam, North Dakota																				
	1) Carp	.01	.04	.01		-	-			-	.03			-	-			-	-		
	2) White Sucker	.01				-				-				-				-			
	3) Goldeye	.02	.01	.01		-	-			-	-			-	-			-	-		
	4) Walleye		.02	.01			-				-				-				-		

TABLE 7 (Continued)

PESTICIDE RESIDUES IN FISH, 1967-1971
(µg/g)

Station No.	Station Location and Fish Species	Dieldrin				Aldrin				Endrin				Lindane				Heptachlor			
		1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971
33	Missouri River Great Falls, Montana																				
	1) Largescale Sucker	-				-				-				-				-			
	2) Redhorse (Sucker)		.04	.01			-				-				-				-		
	3) Goldeye		-	.02			-				-				-				-		
	4) Channel Catfish		.04				-				-				-				-		
	5) Yellow Perch	-				-				-				-				-			
	6) Rainbow Trout	-				-				-				-				-			
HUDSON BAY DRAINAGE																					
34	Red River Noyce, Minnesota																				
	1) White Sucker	.08	.03	.01		-	-			-	-			.03	-			-	-		
	2) Goldeye	.25	.03			-	-			-	-			.03	-			-	-		
	3) Sauger	.23	.06	.01		-	-			-	-			.06	.06			-	.06		
COLORADO RIVER SYSTEM																					
35	Green River Vernal, Utah																				
	1) Carp	-	-	.01		-	-			-	-			-	-			-	-		
	2) Channel Catfish	-				-				.01				-				-			
	3) Black Bullhead	.01	-	.01		-	-			-	-			-	-			-	-		
	4) Green Sunfish		-				-				-				-				-		
	5) Flannelmouth Sucker			.01																	
36	Colorado River Imperial Reservoir, Arizona																				
	1) Carp	.01	-	.01	.01	-	-			.02	-			.01	-			.01	-		
	2) Channel Catfish	.04		.01		.01				.71				.01				-			
	3) Bluegill		-				.01				-				-				-		
	4) Largemouth Bass	-	-	.01	.07	-	-			-	-			-	-			-	-		
	5) Redear Sunfish				.01																
INTERIOR BASINS																					
37	Truckee River Fernley, Nevada																				
	1) Carp	-	.01	-		-	-			-	-			-	-			-	-		
	2) Largescale Sucker	-				-				-				-				-			
	3) Brown Bullhead		.02	.01			-				-				-				-		
	4) Largemouth Bass		.06	.02			-				-				-				-		
38	Utah Lake Provo, Utah																				
	1) Carp	-	.02	.02		-	-			.01	-			-	-			-	-		
	2) Brown Bullhead	-	-			-	-			-	-			-	-			-	-		
	3) White Bass	-	-	.02		-	-			-	-			.01	-			-	-		
	4) Black Bullhead			.03																	

TABLE 7 (Continued)

PESTICIDE RESIDUES IN FISH, 1967-1971

(µg/g)

Station No.	Station Location and Fish Species	Dieldrin				Aldrin				Endrin				Lindane				Heptachlor			
		1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971
CALIFORNIA STREAMS																					
39	Sacramento River Sacramento, California																				
	1) Carp	-	-	.01		-	-			-	-			-	-			-	-		
	2) Channel Catfish		.02				-				-				.13				-		
	3) Brown Bullhead	-				-				-				-							
	4) Largemouth Bass		.05	.01			-				.02				-						
	5) Northern Squawfish	-				-				-				-				-			
	6) White Catfish			.01																	
40	San Joaquin River Los Banos, California																				
	1) Carp	-	.04	.01		-	-			-	-			-	-			-	-		
	2) Channel Catfish	.01	.31	.20		-	-			-	-			-	-			-	-		
	3) Black Crappie	-	.29	.36		-	-			-	-			-	-			-	-		
COLUMBIA RIVER SYSTEM																					
41	Snake River Hagerman, Idaho																				
	1) Largescale Sucker	-	.04	.05		-	-			-	-			-	-			-	-		
	2) Mountain Whitefish	-				-				-				-				-			
	3) Rainbow Trout	-		.04		-				-				-				-			
	4) Northern Squawfish	-	.02	.01		-	-			-	-			-	-			-	-		
42	Snake River Lewiston, Idaho																				
	1) Carp	-				-				-				-				-			
	2) Largescale Sucker	-	.05	.05		-	-			-	-			-	-			-	-		
	3) Channel Catfish	-				-				-				-				-			
	4) Smallmouth Bass		.07	.04			-				-				-				-		
	5) Northern Squawfish	-	.06	.02		-	-			-	-			-	-			-	-		
43	Salmon River Riggins, Idaho																				
	1) Largescale Sucker	-	-	-		-	-			-	-			-	-			-	-		
	2) Smallmouth Bass	-				-				-				-				-			
	3) Northern Squawfish	-				-				-				-				-			
44	Yakima River Grainger, Washington																				
	1) Carp	-	.08			.02	-			-	-			-	-			-	-		
	2) Largescale Sucker	-		.03		-				-				-				-			
	3) Chiselmouth		.03				-				-				-				-		
	4) Black Crappie		.10	.04			-				-				-				-		
	5) Northern Squawfish	-				-				-				-				-			
	6) Smallmouth Bass			.03																	

TABLE 7 (Continued)

PESTICIDE RESIDUES IN FISH, 1967-1971

(mg/g)

Station No.	Station Location and Fish Species	Dieldrin				Aldrin				Endrin				Lindane				Heptachlor			
		1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971
45	Willamette River Oregon City, Oregon																				
	1) Carp	-				-				-				.02				-			
	2) Largescale Sucker	-	.03	.09		-	-			-	-			.02	-			-	-		
	3) Coho Salmon	-				-				-				-				-			
	4) Northern Squawfish	-	.03			-	-			-	-			-	-			-	-		
	5) Chiselmouth			.01																	
	6) White Crappie			.08																	
46	Columbia Rive. Bonneville Dam, Oregon																				
	1) Carp		.04				-				-				-				-		
	2) Largescale Sucker	-		.01		-				-				-				-			
	3) Rainbow Trout	-				-				-				-				-			
	4) Northern Squawfish	-	-	.01		.01	-			-	-			-	-			-	-		
	5) Chiselmouth							.03													
PACIFIC COAST STREAMS																					
47	Klamath River Hornbrook, California																				
	1) Klamath Sucker		-	-			-				-				-				-		
	2) Pumpkinseed		-				-				-				-				-		
	3) Yellow Perch	-	-	-		-	-			-	-			-	-			-	-		
	4) Rainbow Trout	-		.01		-				-				-				-			
48	Rogue River Gold Ray Dam, Oregon																				
	1) Bridgelip Sucker	-	.02	.02		-	-			-	-			-	-			-	-		
	2) Brown Bullhead	-		.02		-				-				-				-			
	3) Largemouth Bass	-				-				-				-				-			
	4) Smallmouth Bass		-				-				-				-				-		
	5) Rainbow Trout		.01																		
	6) Black Crappie			.02																	
ALASKAN STREAMS																					
49	Chena River Fairbanks, Alaska																				
	1) Longnose Sucker	-	-	.01		-	-			-	-			-	-			-	-		
	2) Lake Whitefish	-				-				-				-				-			
	3) Round Whitefish		-	.01			-				-				-				-		
	4) Arctic Grayling		-	.01			-				-				-				-		
	5) Coho Salmon	-				-				-				-				-			
50	Kenai River Soldatna, Alaska																				
	1) Longnose Sucker	-	-	-		-	-			-	-			-	-			-	-		
	2) Round Whitefish		-				-				-				-				-		
	3) Rainbow Trout	-		-		-				-				-				-			
	4) Lake Trout		-	-			-				-				-				-		
	5) Sockeye Salmon	-				-				-				-				-			

TABLE 7 (Continued)

PESTICIDE RESIDUES IN FISH, 1967-1971

(ug/g)

Station No.	Station Location and Fish Species	Heptachlor Epoxide				Chlordane				Toxaphene				B.H.C.				Ent. P. C. B. s			
		1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971
ATLANTIC COAST STREAMS																					
1	Stillwater River																				
	Old Town, Maine																				
	1) White Sucker	-	-			-	-			-	-					.22				.27	
	2) Yellow Perch	-	-			-	-			-	-					.25				.31	
	3) White Perch	-				-				-											
	4) Chain Pickerel	-	-			-	-			-	-					.07				.45	
2	Connecticut River																				
	Windsor Locks, Connecticut																				
	1) White Catfish	-	.52			-	-			-	-					.23				2.16	
	2) Brown Bullhead		.04				-				-										
	3) Yellow Perch	-				-				-						.20				3.40	
	4) White Perch	-	.65			-	.38			-	-					.25				5.34	
3	Hudson River																				
	Poughkeepsie, New York																				
	1) Goldfish	-	8.46			-	7.29			-	-					.51				9.30	
	2) Pumpkinseed	-	2.40			-	2.24			-	-					.09				2.68	
	3) Largemouth Bass	1.18	6.93			-	4.22			-	-					.27				4.82	
4	Delaware River																				
	Camden, New Jersey																				
	1) White Sucker	-	.20			-	-			-	-					.20				2.02	
	2) Brown Bullhead	-	.18			-	.41			-	-					.18				4.00	
	3) White Perch	-	.68			-	-			-	-					.18				<.10	
5	Susquehanna River																				
	Conowingo, Maryland																				
	1) Carp	.02	.07			.11	-			-	-					.01				.69	
	2) Channel Catfish	-	.04			.02	-			-	-					.16				1.21	
	3) Yellow Perch	.01	.09			.01	-			-	-					.02				1.31	
6	Potomac River																				
	Little Falls, Maryland																				
	1) Carp	-	.13	-		.01	-	.14		-	-					.01				1.04	
	2) White Sucker	-	.06			-	-			-	-					.01				.56	
	3) Smallmouth Bass	-				.01				-											
	4) Largemouth Bass		.11				-				-					.01				1.04	
7	Roanoke River																				
	Roanoke Rapids, N. C.																				
	1) Carp	-				-				-											
	2) Redhorse (Sucker)		.03				-				-					.02				<.10	
	3) Lake Chubsucker	-				.01				-											
	4) Brown Bullhead	-	-			.03	-			-	-					.01				.34	
	5) Largemouth Bass	-	.03			.02	-			-	-					.01				<.10	
8	Cape Fear River																				
	Elizabethtown, N. C.																				
	1) Gizzard Shad	-				.03				-						.10				.86	
	2) Channel Catfish		.07				-				-					.20				3.26	
	3) Brown Bullhead	-	-			.01	-			-	-					.05				.64	
	4) Largemouth Bass	-	.05			.01	-			-	-										

TABLE 7 (Continued)

PESTICIDE RESIDUES IN FISH, 1967-1971
(µg/g)

Station No.	Station Location and Fish Species	Heptachlor Epoxide				Chlordane				Toxaphene				B. H. C.				P.C.B.s			
		1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971
9	Cooper River Summerton, S. C.																				
	1) Spotted Sucker	-	.07			.01	-			-	-					.01				<.10	
	2) Bluegill	-	.04			.02	-			-	-					-				.73	
	3) Largemouth Bass	.03	-			.05	-			-	-					.02				<.10	
10	Savannah River Savannah, Georgia																				
	1) Carp	-	.08			.02	-			-	-					.02				.50	
	2) Striped Mullet		.08				-				-										
	3) Bluegill	-				.03				-						.02				.52	
	4) Largemouth Bass	-	.02			.05	-			-	-					.02				1.18	
11	St. Johns River Welaka, Florida																				
	1) Striped Mullet	-	.02			.01	-			-	-										
	2) Channel Catfish	-	.02			-	-			-	-					.01				.14	
	3) Redbreast Sunfish	-	.02			.03	-			-	-					-				.15	
	4) Largemouth Bass	-				.07				-						.01				.31	
12	St. Lucie Canal Indiantown, Florida																				
	1) White Catfish	-				.01				-											
	2) Channel Catfish		-				.15				-					.03				1.25	
	3) Bluegill	-	.05			.01	-			-	-					-				.35	
	4) Largemouth Bass	-	.03			.07	.04			-	-					-				.56	
GULF COAST STREAMS																					
13	Apalachicola River Jim Woodruff Dam, Florida																				
	1) Spotted Sucker	-	.04			.02	.08			-	-					.03				<.10	
	2) Channel Catfish	-	-			-	.17			-	-					.04				.69	
	3) Largemouth Bass	-	.09			-	.14			-	-					.07				<.10	
14	Tombigbee River McIntosh, Alabama																				
	1) Carp	-	-			-	-			-	-					.08				<.10	
	2) Striped Mullet	-	-			.01	-			-	-					.28				<.10	
	3) Largemouth Bass	-	-			.01	-			-	-					.12				<.10	
15	Mississippi River Luling, Louisiana																				
	1) Carp	.01	.08	.04		-	.09	.09		-	-					.99				.46	
	2) Striped Mullet	-	.73	-		-	-	.09		-	-					1.14				1.39	
	3) Channel Catfish	-	-	.03		-	.23	.09		-	-					1.50				.66	
16	Rio Grande River Brownsville, Texas																				
	1) Gizzard Shad	-	-			.01	-			-	-					.06				.22	
	2) Channel Catfish	-	-			.01	-			-	-					.06				<.10	
	3) Flathead Catfish	-				.01				-											
	4) Blue Catfish		-				-				-					.14				<.10	

TABLE 7 (Continued)

PESTICIDE RESIDUES IN FISH, 1967-1971

(µg/g)

Station No.	Station Location and Fish Species	Heptachlor Epoxide				Chlordane				Toxaphene				B. H. C.				P.C.B.s			
		1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971
GREAT LAKES DRAINAGE																					
17	Gennesse River																				
	Scottsville, New York																				
	1) White Sucker	.01	.02	-		-	-	.12		-	-					.20				1.54	
	2) Rock Bass		.08				-				-					.01				.39	
	3) Walleye	.71	.65	-		-	.39	.10		-	-					-				1.25	
18	Lake Ontario																				
	Port Ontario, New York																				
	1) Yellow Perch	.47	1.64			-	-			-	-					.31				7.08	
	2) White Perch	-	1.74			-	-			-	-					.26				7.68	
	3) Rock Bass	.12	.86			-	-			-	-					.14				4.10	
19	Lake Erie																				
	Erie, Pennsylvania																				
	1) White Sucker	-	.03			-	-			-	-					.01				2.48	
	2) Freshwater Drum	-	.08			-	-			-	-					.02				1.94	
	3) Yellow Perch	-	.05			-	-			-	-					.01				2.33	
20	Lake Huron																				
	Bayport, Michigan																				
	1) Carp	.17	-			-	-			-	-					.04				11.7	
	2) Channel Catfish	-	-			-	-			-	-					.29				4.00	
	3) Yellow Perch	-	-			-	-			-	-					.02				4.02	
21	Lake Michigan																				
	Sheboygan, Wisconsin																				
	1) Bloater	-	-			-	-			-	-					.08				1.34	
	2) White Sucker															.20				14.8	
	3) Yellow Perch															.05				12.6	
22	Lake Superior																				
	Bayfield, Wisconsin																				
	1) Bloater															.03				3.47	
	2) Lake Whitefish															.05				1.96	
	3) Round Whitefish	-	-			-	-			-	-					.02				2.84	
	4) Lake Trout	-	-			-	-			-	-										
MISSISSIPPI RIVER SYSTEM																					
23	Kanawha River																				
	Winfield, Virginia																				
	1) Carp	.01	.42			-	-			-	-					.31				.31	
	2) Channel Catfish	.02				-				-											
	3) Brown Bullhead	.01	.35	.34		-	-	-		-	-					4.37				1.20	
	4) White Crappie		.38	.17			-	-			-					2.19				.83	
24	Ohio River																				
	Marietta, Ohio																				
	1) Carp	.05	.89	-		-	.56	.68		-	-					.22				1.73	
	2) Redhorse (Sucker)	.09	.46	-		-	.31	.20		-	-					.18				<.10	
	3) Channel Catfish	.23	.93	-		-	.66	.98		-	-					.63				6.77	
	4) Largemouth Bass			-				.95								.47				8.07	

TABLE 7 (Continued)

PESTICIDE RESIDUES IN FISH, 1967-1971

(ug/g)

Station No.	Station Location and Fish Species	Heptachlor Epoxide				Chlordane				Toxaphene				B. H. C.				Est. P.C.B.s			
		1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971
25	Cumberland River																				
	Clarksville, Tennessee																				
	1) Carp	-	.12			.01	-			-	-					.03				.89	
	2) Bluegill	-	.09			.02	-			-	-					.02				1.19	
	3) Largemouth Bass	-	.29			.03	-			-	-					.02				3.15	
26	Illinois River																				
	Beardstown, Illinois																				
	1) Bigmouth Buffalo	.01	.11			.24	.17			-	-					.07				1.21	
	2) Black Bullhead	-	.11			.18	.24			-	-										
	3) White Crappie	-	.08			.13	.15			-	-					.09				1.79	
	4) Carp															.06				11.3	
27	Mississippi River																				
	Gutenberg, Iowa																				
	1) Carp		.12				-				-					.01				.54	
	2) Bigmouth Buffalo	-				-				-											
	3) Redhorse (Sucker)		.10				-				-										
	4) Bluegill	-	.03			-	-			-	-					.01				.35	
	5) Largemouth Bass	-	.03			-	-			-	-					-				1.41	
28	Arkansas River																				
	Pine Bluff, Arkansas																				
	1) Carp	-	-			-	-			-	-					.19				1.60	
	2) Smallmouth Buffalo	.01	.20	.16		.02	-	-		.02	-					.08				2.66	
	3) Channel Catfish		.12				-				-										
	4) Flathead Catfish	.01				.01				-						.02				3.88	
29	Arkansas River																				
	Keystone Reservoir, Okla.																				
	1) Carp	-	.04			-	.09			-	-					.01				.24	
	2) Bluegill	-	.12			.02	.06			-	-					.03				.46	
	3) Largemouth Bass	-	.08			.01	.72			-	-					.09				.66	
30	White River																				
	DeValls Bluff, Arkansas																				
	1) Carp	-	-			-	-			-	-					.07				<.10	
	2) Bigmouth Buffalo	.01	-			-	-			-	-					.03				<.10	
	3) Channel Catfish	-	.19			.01	-			-	-					.01				<.10	
31	Missouri River																				
	Nebraska City, Nebraska																				
	1) Carp	.03	-			.22	-			-	-					.02				4.58	
	2) Channel Catfish	.01	.05			.24	-			-	-					.01				.47	
	3) White Crappie	-				-				-											
	4) Walleye		.06				-				-										
	5) Goldeye															.05				1.33	
32	Missouri River																				
	Garrison Dam, North Dakota																				
	1) Carp	-	.01			-	-			-	-					.01				<.10	
	2) White Sucker	-				-				-											
	3) Goldeye	-	.01			-	-			-	-					.02				.18	
	4) Walleye		-				-				-					.01				.22	

TABLE 7 (Continued)

PESTICIDE RESIDUES IN FISH, 1967-1971
(µg/g)

Station No.	Station Location and Fish Species	Heptachlor Epoxide				Chlordane				Toxaphene				B. H. C.				Est. P. C. B.s			
		1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971
33	Missouri River																				
	Great Falls, Montana																				
	1) Largescale Sucker	-				-				-						.02				.25	
	2) Redhorse (Sucker)		.11				-				-					.08				2.35	
	3) Goldeye		-				-				-										
	4) Channel Catfish		.05				-														
	5) Yellow Perch	-				-				-											
	6) Rainbow Trout	-				-				-											
HUDSON BAY DRAINAGE																					
34	Red River																				
	Soyce, Minnesota															.01				.44	
	1) White Sucker	-	-			-	-			-	-										
	2) Goldeye	-	-			-	-			-	-					.01				1.09	
	3) Sauger	-	.07			-	.06			-	-										
COLORADO RIVER SYSTEM																					
35	Green River																				
	Vernal, Utah															-				.83	
	1) Carp	-	-			.01	.02			-	-										
	2) Channel Catfish	-				.02				-											
	3) Black Bullhead	-	-			.01	-			-	-					-				.15	
	4) Green Sunfish		-				-				-										
	5) Flannelmouth Sucker															.02				2.14	
36	Colorado River																				
	Imperial Reservoir, Arizona																				
	1) Carp	-	-			-	-			-	-					.01	<.01			.25	.03
	2) Channel Catfish	-				-				-						.01				.64	
	3) Bluegill		-				-				-										
	4) Largemouth Bass	-	-			.01	-			-	-					.01	<.02			.40	.18
	5) Redear Sunfish																<.01				.05
INTERIOR BASINS																					
37	Truckee River																				
	Fernley, Nevada																				
	1) Carp	-	-			-	-			-	-					.01				.54	
	2) Largescale Sucker	-				-				-											
	3) Brown Bullhead		-				-				-					.02				.71	
	4) Largemouth Bass		-				-				-					.03				.98	
38	Utah Lake																				
	Provo, Utah																				
	1) Carp	-	-			.01	-			-	-					.01				.29	
	2) Brown Bullhead	-	-			.02	-			-	-										
	3) White Bass	-	-			.03	-			-	-					.01				1.04	
	4) Black Bullhead															.01				.21	

TABLE 7 (Continued)

PESTICIDE RESIDUES IN FISH, 1967-1971
(µg/g)

Station No.	Station Location and Fish Species	Heptachlor Epoxide				Chlordane				Toxaphene				B. H. C.				Est. P. C. B. s			
		1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971	1967	1968	1969	1971
CALIFORNIA STREAMS																					
39	Sacramento River Sacramento, California																				
	1) Carp	-	-			-	-			-	-					-				<.10	
	2) Channel Catfish		-				.04				-										
	3) Brown Bullhead	-				-				-											
	4) Largemouth Bass		.04				-				-					.01				<.10	
	5) Northern Squawfish	-				-				-											
	6) White Catfish															-				<.10	
40	San Joaquin River Los Banos, California																				
	1) Carp	-	.02			-	-			-	-					-				<.10	
	2) Channel Catfish	-	.10			-	-			-	-					.01				<.10	
	3) Black Crappie	-	.04			-	-			-	-					.02				<.10	
COLUMBIA RIVER SYSTEM																					
41	Snake River Hagerman, Idaho																				
	1) Largescale Sucker	-	-			-	-			-	-					.01				.34	
	2) Mountain Whitefish	-				-				-											
	3) Rainbow Trout	-				-				-						.01				.55	
	4) Northern Squawfish	-	-			-	-			-	-					-				.76	
42	Snake River Lewiston, Idaho																				
	1) Carp	-				-				-											
	2) Largescale Sucker	-	-			-	-			-	-					.02				.48	
	3) Channel Catfish	-				-				-											
	4) Smallmouth Bass		-				-				-					.01				<.10	
	5) Northern Squawfish	-	-			-	-			-	-					-				.58	
43	Salmon River Riggins, Idaho																				
	1) Largescale Sucker	-	-			-	-			-	-					-				.40	
	2) Smallmouth Bass	-				-				-											
	3) Northern Squawfish	-				-				-											
44	Yakima River Grainger, Washington																				
	1) Carp	-	-			-	-			-	-										
	2) Largescale Sucker	-				-				-						.01				<.10	
	3) Chiselmouth		-				-				-										
	4) Black Crappie		-				-				-					.01				.88	
	5) Northern Squawfish	-				-				-											
	6) Smallmouth Bass															.01				<.10	

TABLE 7 (Continued)

PESTICIDE RESIDUES IN FISH, 1967-1971
(µg/g)

Station No.	Station Location and Fish Species	Heptachlor Epoxide 1967	1968	1969	1971	Chlordane 1967	1968	1969	1971	Toxaphene 1967	1968	1969	1971	B. H. C. 1967	1968	1969	1971	Est. P. C. B. s 1967	1968	1969	1971
45	Willamette River Oregon City, Oregon																				
	1) Carp	-				-				-						.12				1.16	
	2) Largescale Sucker	-	.05			-	-			-	-										
	3) Coho Salmon	-				-				-											
	4) Northern Squawfish	-	.05			-	-			-	-					.03				.71	
	5) Chiselmouth															.07				1.11	
	6) White Crappie																				
46	Columbia River Bonneville Dam, Oregon																				
	1) Carp		-				.17			-	-					.01				1.04	
	2) Largescale Sucker	-				-				-											
	3) Rainbow Trout	-				-				-						.01				.01	
	4) Northern Squawfish	-	-			-	-			-	-					.02				.98	
	5) Chiselmouth																				
PACIFIC COAST STREAMS																					
47	Klamath River Hornbrook, California																				
	1) Klamath Sucker		-				-				-					-				.13	
	2) Pumpkinseed		-				-				-										
	3) Yellow Perch	-	-			-	-			-	-					.01				.28	
	4) Rainbow Trout	-				-				-						.01				.27	
48	Rogue River Gold Ray Dam, Oregon																				
	1) Bridgelip Sucker	-	.04			-	-			-	-					.02				2.75	
	2) Brown Bullhead	-				-				-						.02				3.62	
	3) Largemouth BAss	.01				-				-											
	4) Smallmouth Bass		.04				-				-										
	5) Rainbow Trout		.08				-				-					.03				1.83	
	6) Black Crappie																				
ALASKAN STREAMS																					
49	Chena River Fairbanks, Alaska																				
	1) Longnose Sucker	-	.04			-	-			-	-					.03				3.87	
	2) Lake Whitefish	-				-				-											
	3) Round Whitefish		.03				-				-					.04				2.62	
	4) Arctic Grayling		.08				-				-					.12				1.42	
	5) Coho Salmon	-				-				-											
50	Kenai River Soldatna, Alaska																				
	1) Longnose Sucker	-	-			-	-			-	-					.01				1.53	
	2) Round Whitefish		-				-				-										
	3) Rainbow Trout	-				-				-						.01				5.48	
	4) Lake Trout		-				-				-					.01				2.64	
	5) Sockeye Salmon	-				-				-											

Table 8. Proposed EPA Numerical Criteria for Pesticides in Freshwater Ecosystems.

Compound	Maximum Permissible Concentration(µg/l)
Organochlorine Insecticides	
Aldrin	0.1
DDT	0.002
TDE	0.006
Dieldrin	0.005
Chlordane	0.04
Endosulfan	0.003
Endrin	0.002
Heptachlor	0.01
Lindane	0.02
Methoxychlor	0.005
Toxaphene	0.01
Organophosphorus Insecticides	
Azinphosmethyl	0.001
Ciodrin	0.1
Coumaphos	0.001
Diazinon	0.009
Dichlorvos	0.001
Dioxathion	0.09
Disulfonton	0.05
Dursban	0.001
Ethion	0.02
EPN	0.06
Fenthion	0.006
Malathion	0.008
Mevinphos	0.002
Nalen	0.004
Oxygemeton methyl	0.4
Parathion	0.001
Phosphamidon	0.03
TEPP	0.3
Trichlorophon	0.002
Carbamate Insecticides	
Carbaryl	0.02
Zectran	0.1